

SEPTEMBER, 1940

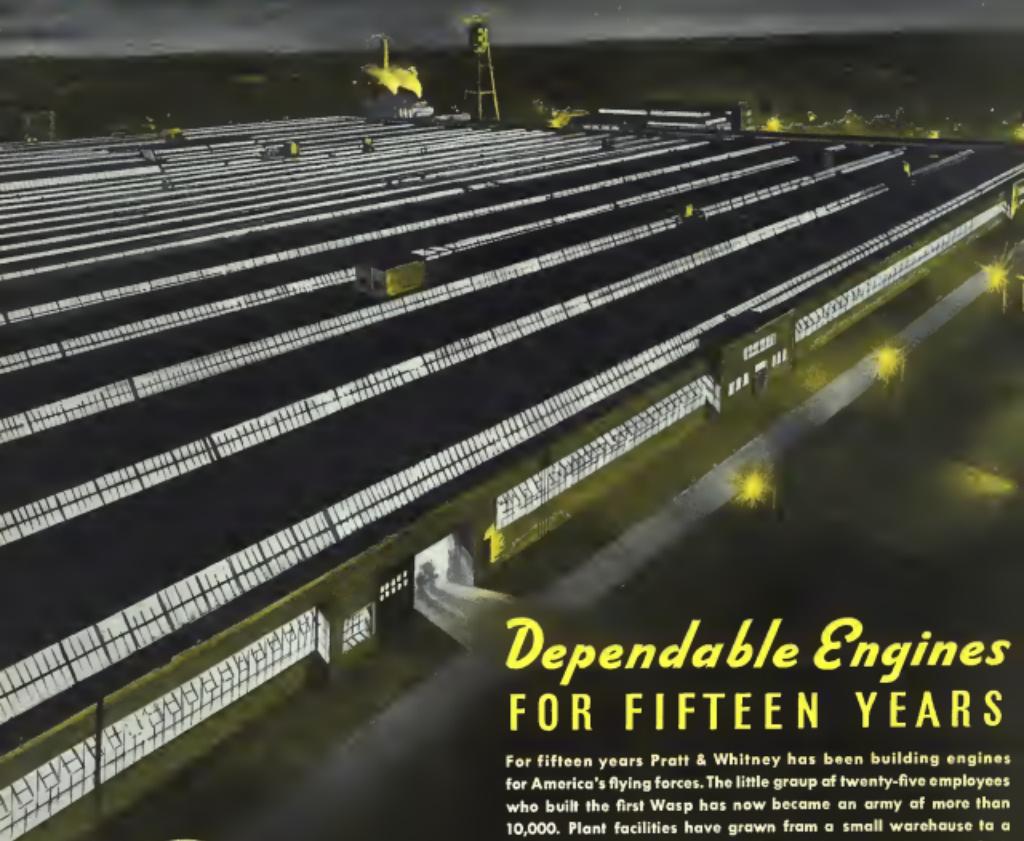
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In This Issue
TWENTY YEARS OF
AIRLINE PROGRESS

AVIATION

The Oldest American Aeronautical Magazine



Dependable Engines FOR FIFTEEN YEARS

For fifteen years Pratt & Whitney has been building engines for America's flying forces. The little group of twenty-five employees who built the first Wasp has now become an army of more than 10,000. Plant facilities have grown from a small warehouse to a mighty factory embracing a million and a quarter square feet. And steadily, throughout the years, an ever-increasing stream of power plants has gone out to the Army, the Navy and the air lines — each adding its share to the significance of a time-honored slogan: *Pratt & Whitney, Dependable Engines.*



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THE
Lockheed
LOG



1940

This year Continental Air Lines adds
new Lockheeds to accommodate
increased passenger demands.



1926

Successful initial operations with 8
Lockheed Vega Series created from
16 previous smaller Lockheed Model



1937

8 Lockheed two-engine "Vega" put
into service, giving increased model
and more passenger accommodations.



1939

8 larger Lockheed "Vega" and
one Lockheed Series expand the
Continental Air Lines Lockheed Fleet.

The EVOLUTION of a SUCCESSFUL AIRLINE

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Continental has always used Lockheeds exclusively. These transports have earned for Continental the distinction of the world's fastest schedules.

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AVIATION December 1940

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producers of "aircraft quality" steels.

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| Automotive & Heating Engineers Salesmen & Technicians | Qualified Aerospace Engineers Salesmen & Technicians |

第十一章 物质的量

卷之三十一

—Baptized and Received into the Church

• 10000 例 •

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卷之三



九月 2013

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基础与应用物理实验

— 15 —

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Journal of Health Politics, Policy and Law



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THE MARCH . . .**

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line offers three 21-
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to handle increased
traveling with ease.

[Section]
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in terms of public engage-
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• 100 •



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| High School | None |
| College | None |
| Technical | None |
| Other | None |
| INTERESTS | |
| Automobiles | None |
| Boating | None |
| Camping | None |
| Photography | None |
| Hobbies | None |
| EXTRA INFORMATION | |
| Spouse | None |
| Children | None |
| Health | None |
| Religious | None |



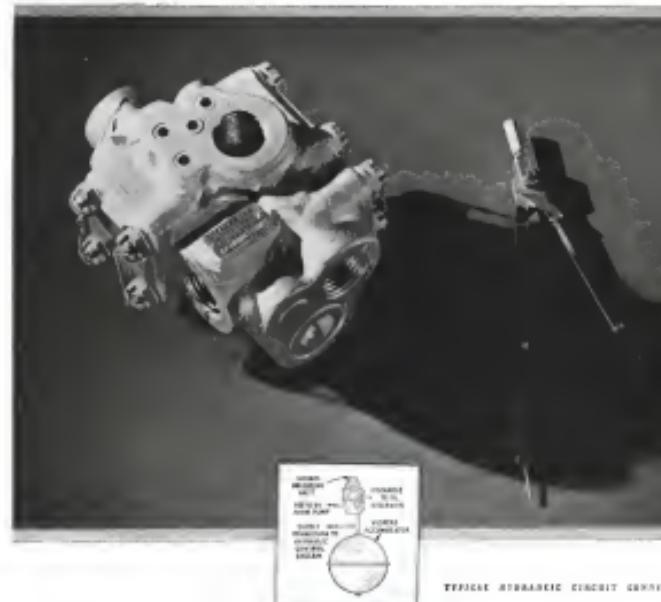
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THE LESSON OF NORWAY

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Now, however, if they had such a large fleet of aircraft which would have operated from mobile airfields and established around them would have been no large-scale concentrations to knock out in any way of disrupting the course of war. Thus far, no concentrations could have been attained quickly.

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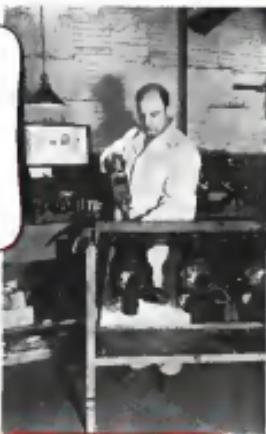
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CHALLENGE TO INDUSTRY'S PATRIOTISM

Calls for Plain Speaking

It is a pity that the present national defense effort in America has had to be made during a pressless election campaign. For a modern defense effort requires an intensely practical industrial power, while an election campaign involves an intensely remissive political propaganda. And those two don't mix.

That is, I see it, as the chief reason for the water of tears and deepest anguish and consternation that the American people have had to wade in the way of sacrifice for patriotic, patriotic and let it not be forgotten, the welfare of the American people are so obviously passing down the road.

We are told that the managers of industry, smirking and smugly under the repeated attacks of government officials for some time back, have been anxious to assume the additional role of defense contractors, especially the large corporations and their subdivisions who innumerable subsubsidiaries have been reluctant to do the applying that might be construed as being closer than the bare for assumption because men in the national emergency. For the use, the business role of full speed ahead have been too great. For the other, the political role of full speed ahead have been too great. So we don't go at full speed ahead.

It is one written to accuse that class of responsibility on either role. On the contrary, it is up to us for some decent and thoughtful consideration on the part of all concerned—consideration for the urgent needs of the nation, for the problems and responsibilities of both the politicians and the industrialists for the elementary principles of patriotic business management, and for the good opinion of the man in the street. He has a right to know what is being done, and he has a right to his and her protection, as it stands in the national defense program—and he knows it. He has a right in the low down on who is going to. And if he is left in ignorance or deliberately deceived for the sake of either political or business whimsies, the payoff will be mighty painful political retribution for the politicians and equally painful business retribution for the business men who may be responsible.

The plain stock fact, to be faced squarely by us all, is that the national defense program is an emergency project—a desperately urgent emergency project.

As is every emergency that confronts a democracy, we are faced by a confusion of counsel. As always, some of the confusion comes from honest but confused people,

most, most of it from ignorants or merely shoddy. But, unhappily, much of it reflects the deliberate purpose of self-sacrifice to fit in required sacrifice—to capture the imagination of a national emergency and a political campaign to boost their own interests. Already the charge that American business men are unpatriotic and interested only in profits has been put out in a consciousness to cover up interests which business men are not in any way interested.

Now the man on the inner bank it hard to see through the mass of excited contradiction. Not because he can't see—the average American can think straight enough when he has the facts. But in this case the facts are obscure and complicated—they have to do with matters that are strange indeed. And to make it worse, at the beginning of the confusion, certain voices immediately went out to "quench" any expression of it all. But, as often happens, most of these simple explanations make the water a lot simpler than it really is.

* * *

Consider, for example, the cop that collects refuse or garbage on either role. On the contrary, it is up to us for some decent and thoughtful consideration on the part of all concerned—consideration for the urgent needs of the nation, for the problems and responsibilities of both the politicians and the industrialists for the elementary principles of patriotic business management, and for the good opinion of the man in the street. He has a right to know what is being done, and he has a right to his and her protection, as it stands in the national defense program—and he knows it. He has a right in the low down on who is going to. And if he is left in ignorance or deliberately deceived for the sake of either political or business whimsies, the payoff will be mighty painful political retribution for the politicians and equally painful business retribution for the business men who may be responsible.

* * *

Politically, political has been the attack on the aircraft industry. It has been made to appear that aircraft manufacturers are not patriotic, or that they are not in their great big project that deserved more than \$15 billion. Actually the \$15 was not a net profit at all, and the only concern of the manufacturers was to fight against incurring losses under the \$15 limitation. And some very glib have sustained the switch from

political viewpoint. The accusations that we "can't fight" which is well at least—whether that may mean physically. Physically political has been the attack on the aircraft industry. It has been made to appear that aircraft manufacturers are not patriotic, or that they are not in their great big project that deserved more than \$15 billion. Actually the \$15 was not a net profit at all, and the only concern of the manufacturers was to fight against incurring losses under the \$15 limitation. And some very glib have sustained the switch from

political viewpoint. They may say, "I do not explain. And in case you are concerned, the purpose of those who tell them is not to explain but to influence. Those who try honestly to explain class must from other side, find it impossible to do the job in such ringing phrases."

As I have said, our country has been caught short.

a result, there are many causes for the confusion and controversy. The plain fact is that we can produce our war equipment by only two means: (1) by converting the industries of peace into the industries of war, so far as that is possible; and (2) by leading from scratch the new factories we need to supplement them. In other words, we must choose—with dispensation however—a new industry to America—an armament industry.

Right there is the core of the problem that now confronts the subversives sincerely trying to equip himself by his pen to national defense. For they are accustomed to act the role of the learned humanist apologist who has no time for the simple man and his perplexities. It does not deal with factual positions and processes. It is not contentious; at least it has not been contentious; it is not contrary—and it may fold up in silence thousands of potential customers it has won over. The author of "National Government and World War" seems to prefer the quietude of the status quo as it pleases with respect to his country and themselves. Which means that my right there is a very dangerous

No more certain atmosphere change ever has been created among American industry and American business men than the invasion of being unwilling to take the normal business risks of the defense program. The risks they are trying to minimize may cannot possibly avoid them there is no substitute and unavoidable risk involved. It clearly is true that, I doubt very much whether such questions and changes ever would have come up if it were not for the fact we are engaged in a political campaign.

Already some of industry's great men have gone ahead with the building of new facilities, the purchase of special materials, and the actual production of armament at the face of all risks, guaranteeing that their government eventually would work out some reasonable plan to protect them against excessive loss. Others, doubtless will follow suit.

But many other companies, for one reason or another, are not in position to do that. So before they begin to expand their facilities to handle defense contracts, they have asked their only personal assurance from their manufacturers to guarantee them—not excessive prices, and no exorbitant profits, not necessarily from taxation, as we are being told, but simply against the excessive losses that may result from very unfavorable conditions.

As this is written, it looks as though the legislature and the regents are trying to accomplish this purpose soon will be forthcoming. Thoughtful and responsive officials of the government understand the situation and what is needed. But, unfortunately, their understanding and action will not quell the professional business-bother. So long as the business-bother continues to exert its influence, the practical encroachments made by it will keep up public demand for a legislature to act for dispossessing persons with the defense programs. And so long as the business-bother finds a acceptor-indicator for their criticisms-

All of which suggests that business men must carry at this time a double responsibility, in addition to their

obvious obligation to do the very best job they know how on their individual parts of the defense program.

The first of these so-called responsibilities is, of course, to avoid any possible basis for the charge that industry is exploiting the defense program in behalf of excessive profit, unfair treatment of labor or any other unseemly self-interest. The second is to see that the men in the street know and understand all that I have tried to tell them in the foregoing.

For the man on the street is deeply troubled about all this. He is in the stores, only in the political centers. To the rest of us, he is the man in the factory, the man on the track, and the man behind the counter that salutes him. He wants, he says up this long living American way, to know what the policeman's change spans. As an option he wants to know if the salaried, working and the members of the service, at which time he will be elected. Knowing the facts, he can answer the critics as far as his own plan is concerned and can see how the same basic laws apply to all industry. If he is a customer, preferring inexperience as a result of the party's service to establish defenses, a knowledge of the facts behind the plan's publication will help to make him a leader. And if he is a member of the community, the plan will equip him to meet adequately all of industry's problems to the credit of his home town.

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FLASHES

picked up along the editorial airways

"Aviation" Leads Defense Expansion

► AVIATION MANUFACTURING has led all industry in expansion for defense, and, contrary to the expectations of some magazine columnists and congressmen, has much to teach us all in the interests of government that other industries may care to go over. At their services all but two of the plane and engine makers have taken defense expansion steps and manufacturers probably will be forthcoming from them within the next few days. Meanwhile Congress is likely to take similar resolutions on the draft. The Senate has had no time to do much besides making a few preliminary passes at revising the discriminatory profit limitation and antimonopoly legislation that has raised so much uncertainty in financing expansion and defense contracts, are particularly enlightening.

The way things look now, no two aviation companies will use exactly the same financing methods. Most of them have gone in for RFC convertible bonds, which provide a fixed rate of interest for operations, fixed fee operations of government owned shadow plants under lease. The RFC loans are all right if they are made to subsidiary companies in the properties of the parent corporations do not become involved. Financial managers will be able to work out the best way to finance their operations, whether they are operated by existing private manufacturers. But if the government tries to operate them, it will divert needed key personnel from our armed forces, it will cost much more and pro-

► ONE OF THE TROUBLES WITH columnists is that they think 7-8 percent is a fair return on your money and it is. But they don't understand that this is gross profit and, when you strip it down to taxes and all the other things a government saddle can take off, you are very likely to end up with 2½ percent. They also forget that companies are made up of a lot of individual stockholders who could sell their stock and buy up a nice profitable hot-checking corporation in a New York sight to make more money.

Fortunately the Army, Navy, and the Defense Commission appreciate the manufacturing problems and have done much to clarify public thinking. The recent comments of Secretary of War Stimson, Defense Commissioner Knobell, and John D. Bissell, head of the Defense Commission, however,

done much less than any other method, and it will start us on the axis road to industrialization and relax that ended in the fall of France.

► ENGLAND ISN'T FALLING as fast as Hitler and some other prophets predicted. The Avg. 13 deadfall for the occupied part of London has come and gone and the city is still holding out. The Blitzkrieg. The time is growing short before the notorious London fog may cover the salutary air of the Empire. But log or no log, war or no war, the almost miraculously performance of the Royal Air Force will go down in history as one of the greatest military achievements of our century. And it is beginning to look as though the British and probably a lot of other people may be eternally indebted to the RAF for the preservation of their institutions and ideals.

Editorial page cap.—The original Post & Whitney Aircraft group. This photo shows 22 of the 23 people on the Post & Whitney staff in December 1923. Standing in a row are C. W. Smith, O. J. Head, F. R. Schaeffer, H. Goodwin, J. J. Keay, David Schaeffer, H. Gudewitz, F. J. Jones, Aman M. Sander, Maria Wildman, Bishop, E. W. D. Wilcox, E. L. Byrd, L. Carpenter, E. H. Cleveland, D. Jack, W. L. Lewis, G. Parsons, A. Kukuska, S. L. Brown, H. King and F. Trotter. O. J. Harte, E. H. Godfrey, and V. G. Sels were not on hand when the photo was taken.



BEHIND THIS NOSE

Behind the eager, modern contours of the Fairchild Trainer M-62 stands a solemn pledge guaranteed by a famous heritage of performance and accomplishment. With fourteen years of experience in the manufacture of quality aircraft—with approximately one thousand of its planes in current service throughout the world, renowned for their rugged construction and unequalled flying characteristics—with its splendidly equipped plant, tooling and staffed for quantity production—with a prestige well deserved internationally enjoyed—FAIRCHILD is fully qualified to produce this many featured military trainer to the entire satisfaction of the most exacting users! The Fairchild M-62 is now in quantity production for the U. S. Army Air Corps.



FAIRCHILD AIRCRAFT

Division of Fairchild Engine & Airplane Corporation
Baltimore, Maryland . . . Cable Address "Fairchild"



BEHIND THE MAGNIFICENT PERFORMANCE of the R.A.F. in the recent Anglo-French conflict lies the remarkable series of the French patrols all the way down the line. We have reason to believe that London has been too much fan in the last few weeks, yet there is no diminution in the courage French seem to have. We have seen the wells-swept grounds of the British Isles, the belching smokestacks and debris of defense as impudent. In further evidence we present (on page 34) a special cablegram to AVIATION from old friend, Lt. G. Grey, who goes on to describe his opinion of one of the bombing raids on London. "Japan's raiding if you will say the war has not changed and the last three years," he will say, "he remained in his position of neutrality on Berlin, which has gone on to press in the last few days, and in his claim that British production has caught up with that of the Germans."

BEDOUGH OF WAR? Let's look at the opening pages of this issue for the news revealing previous accomplishments of damage to air transports. We are celebrating the seventh anniversary of the completion of the first transoceanic mail route with stops between the continents of America and Asia. An stupendous journey during which still nearly two decades of preparation lie for the flying future. The services were devised to strengthen effect and the often tragic struggle to pull our leaders clear together in terms of time. The dubious was the years of development, the long and hard-hammered gains of the pioneers, in perfecting safety and learning when not to fly. And the forces have begun with a firmly founded public acceptance of air transport as first-class transportation. It is hoped that we will soon see lower rates of fare, reduced airfares, better service, better developed, more and more expanded markets, and possibly a non-passenger arrangement for pleasure and vacation travel similar to that initiated recently by the railroads.

BUT AIRLINE PROGRESS will be cramped unnecessarily and unfairly if the proposed excess profits tax legislation emerges from Capitol Hill in its present form. They would be punished by small exceptions because of the poor showing during the last few years. It is argued when they were plotted that these earnings were too exorbitant and improving their facilities. Col. Edgar E. Gorrell of the Air Transportation Association of America has presented these facts clearly in the hearings and it is hoped that Congress will see fit to light.

BTHE PRESIDENT HAS ABOUT

FACED once again. This time it should be handled so that the best interests of the nation appear as a major consideration. It looks as though the only weapon report made by the C.I.A. shortly after it was established would be taken off the shelves and used as a basis of expansion of the surplus program. The program is now \$100,000,000. It is to be expanded and cut for the new ports and refit of the cooperation in the Navy arm. Cooperation in the War and Navy Departments with the Civil Aeronautics Board seems consideration of defense needs in the airport plan.

BA P. & W. ADVERTISEMENT for an unusual cause to our interests the other day and we were both interested and gratified to read the strong statement. "Impulses from personnel employed by other organizations engaged in national defense production set us apart." Until very recently there had

been too much personal turnover and personnel quitting in the system. Between P. & W. and its to be held concerned for the defense industry, the policy behind the defense program has been the loss of personnel of prime. Their flight-division should serve as an example to other defense industries faced with the problem of expansion and with shortages of highly skilled and trained personnel.

BOUTLAWERS WILL SPEND that Labor Day with their families for the first year, camp park because there are no National Forest Camps. The major show will be sponsored next year by N.A.A., with Southwest Airlines making it, probably in New York, Chicago and West Coast.

IT FEELS TO FLY



Mankind is building a tomorrow plane to solve his mountains problems.



**Such Bendix units have made
MILLIONS of
"Happy Landings"**



Bendix Wheel and Brake—the most reliable, most compact, most compact, a type in general industry service.



Bendix Pilot Seat—Designed for comfort, weighs 25 pounds. Subsidiary of 2000 pounds of ultralight landing gear.



Bendix Pneumatic Shock Strut—The unique shock absorber, hydraulically operating shock—newly designed exclusively for particular land requirements.

More Americans are flying every month...American Air Commerce sets new records of passenger volume, of mileage, of safety. Why? Because public confidence in the safety of air travel is based by the admirable craftsmanship of our whole industry.

We all know how aviation requires passenger confidence so vastly and so smoothly take off and landing and cruising.

Bendix builds that... aviation engineers it, ro-ro, for any airplane... follows it through with serving assurance that ensures peace-of-mind for the airline operator.

Years of painstaking analysis of every fleet, study of the latest research, constant production studies in the design and manufacturing of Bendix Free-fallable Shock Struts, Bendix Wheels and Brakes and Bendix securable and swivellable Tail-Knuckle Assemblies

Inertial impact shocks and the lesser bumps of taxi and take off runs are efficiently absorbed, deceleration is effected or resonance dissipated and with maximum safety ensured.

Every factory, every compilation of landing gear data, every benefit of Bendix years of experience in this specialized work, constitute industry's command

BENDIX PRODUCTS DIVISION
OF BENDIX AVIATION CORPORATION - SOUTH BEND, INDIANA
AIRCRAFT WHEELS • BRAKES • PILOT SEATS • PNEUMHAULIC SHOCK STRUTS



By Robert Oshern

BY THE TIME this appears, National Aviation Day (August 9th) will have been celebrated as easily by Presidential Proclamation, setting "the people of the United States to observe the day with appropriate exercises to further and stimulate the interest in aviation in this country."

This is all very well, Mr. President, to keep the public in a happy condition. In the aircraft industry we're wondering if you could also set aside another day simply for the people in the industry, to be known as "National Who Cares About Aviation Day". On that day everyone can

try really hardtry. As I have been much in the company of longshoremen, coal miners, newspaper men and pilots in my time, when I say that, my sense of euphoria and soaring words were not entirely idle. I am sure that I know whereof I speak. Whenever he put his elbow down at the point of a thumb-tack, or the elongated diamond all over his drawing with a bent pencil, as all designers do, or the semidemigods would the uppermost model new car, the engineer would be as singular in his appearance as that of "Old Prof". And his performance was all the more remarkable. In that a lady珊瑚rapher sat not far away from his floor, and he had to adhere scrupulously without missing his vital stroke a whopper.

One day that engineer was working along and suddenly, leaning back on his high stool and with his feet propped up in the usual rude under-the-table, when, without even a warning crack, his inferior and innocent drawing tool suddenly exploded—shattered as miserably as though it had been hit by a leaden bullet. Flying in all directions, giving less a few full three feet to the floor where he landed on his rump. Eye witness agreed for days afterward as to whether he had broken his neck or not. He did not, however, and after getting a pressing plaster cast to fit his broken leg, he got up again, and when we were sure he had not been hurt, a hand bill on as we stand for the soldier words is this. Here, we all thought, was an occasion worthy of the master—such heights in which he alone could reach—a soaring sense of the art which would make the old times

that of the day he started working along quietly, hopping restlessly to his desk, and then, with a leap from his drawing, however when something happened to disturb the even course of his way he would break out into a display of prodigious which

kindness given credit for.

Most of the day he sat working along quietly, hopping restlessly to his desk, and then, with a leap from his drawing, however when something happened to disturb the even course of his way he would break out into a display of prodigious which

we all know. When will they park all of them?" he keeps asking. So we turned the problem over to our other boy, who is chief engineer to me in my factory. "We'll have one of our lorry drivers, called a 'lorry', for every one, and give it to the boy." We told him to take the dimensions of a parent plane and multiply by 50,000.

The boy hurried out, copy of "Herr's Blue with a Blue Seal" and some notes in his favorite book on the history of the English Empire.

Pretty soon he came back with a wry smile. "Dad," he said, "guess there won't be enough on the side-rate."

"Look," he said, "a field would have to be 11 miles square."

THE INTREPID AVIATOR says he doesn't know what the younger generation is reading on. He read in the paper recently that the young U.S. Army training program had established a custom whereby a student pilot's shirt had to be torn off by the rest of the gang right after taking from his first solo and when a girl student asked the other day that she even tore off a portion of her slip.



When he learned to fly, he commented between puffs on one of our cigars, all that happened to a solo pilot who had just come down from the grip of hell from his instructors depending on knee slides he lowered the Jenny before being able to get it to stay on the ground.



TWENTY YEARS OF AIRLINE PROGRESS

By Carl Herkess
Assistant Edm. AVIATION

Above, an old De Havilland mail plane after a typical forced landing. At right, a Boeing 247, one of the first commercial transports. Below, a Douglas C-47 on the Charynecoff Lake in 1932 when it was selected by Pan Am to make the first transoceanic flight. This was followed by Pan Am's purchase of Boeing 247s.

Left upper: A Boeing 40, the first of that pioneering airline which began its mail service between San Francisco and Los Angeles in 1928. Right: An early Boeing 40 passenger plane in a small cabin version.

Left center: Dan Gurney, the Ford 40 owner, leaves on the "Big Green," a rugged big-seater utility airplane built with compartmentalized seats and compartments in which he stored his business belongings. He started Air Transport, a predecessor of United Air Lines.

Lower left: A transoceanic Boeing 307 which could carry twelve passengers plus a load of cargo. These planes were used and maintained by the mail route. Bottom right:

AIRLINE WEATHER MEN with their two-way radio equipment have been flying in since 1930. In the early days they were called sky pilots telephoned about the existence of an emergency landing field and responded, "How high is your netting?"

The controller took a quick glance around his office and replied, "About 30 ft. I think, but if you were a mosquito you'd be up there."

Another pilot, telephoning in a field for information, asked, "How's the weather?"

"Not so bad for this time of year," said the controller.

These two incidents are typical of transoceanic flying at twenty years ago when a pilot had to depend on an cockpit airplane behind an engine that might let him down at any moment, with no adequate weather forecasts, no radio, and only his own wits to guide him.

The 20th anniversary of the first coast-to-coast airway is being celebrated this month. On Sept. 8, 1930, the last leg of the air mail route running from New York to San Francisco was completed and air mail pilots began flying this schedule along the great stretch of country. From that beginning has come "U.S. Air Mail Route

No. 7," which is flown by United Air Lines today.

The growth in commercial aviation has been so rapid that mistakes reflecting unfavorably on the grace or economy of today have difficulty finding place in history. The first transoceanic air route operation, for example, was just beginning. Yet in 1930 it had taken a tremendous energy and determination, as well as pioneering spirit, to fly the West Coast and the East Coast together with regular service.

First of all the mail routes that were later to become transoceanic airways were the Chicago to Cleveland route, which opened on May 15, 1929. On July 1 of that year the Cleveland New York service was started. Mail routes were pushed westward on May 15, 1930 when the Chicago to Omaha service was established. Then, on Sept. 8 of that year, the final link of the "Oceans-Sun Pacific" route, an airway linking the Pacific and the Atlantic for the first time.

On route 700 gave way to stage coaches and the pony rider express, which in turn had been superseded by railroad teams, including their mule drivers, pack animals. Finally came the airplane, not very fast, or not so fast indeed by today's standards—but airplanes that were to lead in a brief space of years in the long-time overnight travel of today between our states and western shores.

(From *in Page 107*)

After many years of evolution, the newer Douglas aircraft shown above have been developed for passenger use. Left: Douglas DC-3 passengers by day; at night, the Douglas transport emerges resplendent under lights, as the Douglas aircraft has become by planes on the airlines prior

Right: The interior of a Douglas today in the modern, comfortable cabin designed to deserve a television choice with individual reading lights and individual ventilation. A United stewardess is invited to attend to passengers' wants and needs. The new Douglas transports are speeded by leaps and bounds with those in comfort.

Lower right: The interior of a Ford tri-motor. Modern planes are now fully-decked-out as are the Ford. Elegance in these ships was an ally rather than passenger load.





Research of today indicates what will be the air transportation of tomorrow. The thoroughness of its work brings every passenger under its constant investigation.

By Jay P. AuWerter, Assistant Editor, AVIATION

ANYONE can walk, but it is only the wise man that knows where he is going. In the same light most anyone can fly, but it is only the wise airline that knows how it is going to do it. In these few simple words is summed up the United Airlines' attitude toward research. United has spent its money over a decade past first opened its doors to a promising research engineer and since that has put nearly half a million dollars and millions more in its continuing to ride on trend. The research engineer was Thorpe D. Keltz, a young graduate who a few years ago had been brought to prominence here when his work carried him to the position of head research en-

gineer for United. Developing the first two-way voice radio communication with a flying altitude to the safety of thin air, and it will long be remembered by United, as it was the beginning of their present research organization. The program has steadily advanced and is already halfway to the status of成熟度 (maturity) and it was through his genius for development that many projects of great value to the airline were put in use.

Through the 1930's the importance of research work on allied applications of aircraft powerplants and fuel economy has been divided into three separate branches. The original group working with Thorpe, with added members, has been left alone to burn instant solar white in the communications service. The engineering research department, which includes cold chamber testing with the resultant aid of air transportation as regards more efficient operation of the airlines. Then there is the third branch, established unparaphrased recently, which comes under the research department, and looks into the whys and whens of passenger and personnel loads during airline operations.

During the past ten years, United has spent an estimated \$400,000 on

J. P. AuWerter, left, vice president in charge of operations. Right, the vibration machine on which communications devices and liquid equipment are tested to simulate conditions in flight. Center right is Thorpe.



AVIATION, September, 1949

airplane on the safety system in all forms. The rule of thumb sets forth in order of respective importance, the line of safety, passenger comfort, and morale. Safety is the first line which enables the dispatcher to bring of planes. In every phase of United's operations safety is always the primary consideration.

From the rules and regulations first United has set down, comes the statement giving the clearest reasons for the need of research. "The public expects the rule of safety to be maintained with the rule of economy to an extent. One need spend only a short time talking with the men in charge to be convinced that this is true."

Research Organization

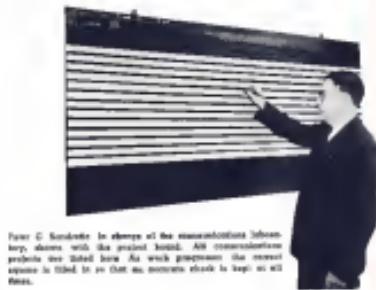
All of the research activities come under the jurisdiction of the vice-president in charge of operations, J. A. Hordley. Communications is headed by J. E. Thorpe, who also has charge of the design of new radio equipment and the development of new radio equipment. Engineering research comes under Ray D. Keltz, who has his own liaison project engineer, such as in charge of a separate department. Cal A. D. Taitie, M.D., formerly of the Army Air Forces Medical School at Randolph Field, Texas, takes care of the medical department as well as of details connected with flight medical research.

Kids of the various departments has its own facilities. However, there is also equipment which is available to all others. Firearms in the flight research plane, the only one of its kind in the world, is one that has a proved ability to shoot 200-D targets. This is to be an invaluable asset to the progress of United's valuable research program.

Then there is the altitude chamber which enables the simulation of aerial conditions and altitude varying from sea level to 60,000 ft. The chamber is

J. P. AuWerter is in charge of the communications research department. United has made numerous contributions to radio research, and operations.

AVIATION Department, 1949



Peter C. Kornbluth is charge of the communications laboratory, shown with the project model. All communications projects are listed here. As each progresses the research section is asked to see that no serious trouble is kept at all times.

used in a variety of projects including radio apparatus testing to ensure proper operation, oxygen tests in connection with the provision of oxygen for passengers during high altitude flight, structural testing for variations of pressure and altitude, however, other types of equipment and problems which will present themselves when airlines start regular high altitude operations.

In a cold chamber, engineers are able to conduct research of temperature and humidity ranging from -40 deg F and auto-pilot relative humidity to +40 deg F and 100% relative humidity. Another laboratory which the equipment tested in the high altitude chamber must also be part of the gases in this chamber in that there are no clouds as far as in sufficient atmosphere.

The vibration table is another piece of equipment, specially designed by the United engineers, it has seats and

(Continued on page 7)



A portion of the research laboratory. In the foreground are benches where equipment of various sorts is built. Through the doors on back is the cold chamber which holds the vibration table. Back offices include a cold chamber test room, the wind test for noise experiments, and a wind tunnel.

Ray B. Kelly is in charge of an interesting research project. It is the development of explosive work to build passenger aircraft and improved design of all units.



Mainliner Maintenance

United Air Lines takes great pride in its mechanics. There's ample reason

AIRLINE maintenance has come a long way since the old days, and one of United's oldest remains. At Meanyson Field just outside of Chicago, where we used to overhaul the steel planes, we had only one spare engine, and we didn't know how to compensate or overheat it. Compressors were interchangeable then, and when a pilot complained that his compressor was not right, we'd take it off and put another on the shaft. When the next pilot complained, we got the spare, and so on. Today we not only know how every system and accessory operates, but we have test equipment for it. When equipment goes back into an airplane after an overhaul, we know it is going to work properly. There is no guessing anymore.

Air travel has become so uniformly excellent in recent years that passengers seldom catch the real spirit of the maintenance mechanics. Airlines

are safe, engines are dependable, the planes are well maintained, and to get from New York to West Coast you might fly nonstop—and both speed and safety are taken for granted. The part that maintenance plays in today's superlative airline performance is seldom front-page news to the air traveler.

Maintenance mechanics along United's coast-to-coast lines are among the best in the industry. At Cheyenne, four standing at the partly dismantled look over the engine bays. They are extremely fit; these engineers and engineers specialize in their particular part of an engine when a ship comes rolling into their hangars. Perfection is a goal, performance status nothing in their view. They look the trouble, and then find and correct it long before it becomes critical.

Sitting in Cheyenne, so let's watch the mechanics and inspectors as the Mainliners fly into Cheyenne where United's

overhaul shop is located. The writers are interested, daily, in getting around the country, so we took three days to visit all while the engines were checked—no drama on drama on the opposite page.

Above left: After 600 hours of flying time, each Douglas is rotated in Cheyenne. It is maneuvered into the hangar and its nose comes at rest at a spot where overhauled work stands may be lowered along each side of the pilot's cockpit. Two portable stands, mounted on rubberized wheels, are locked in position before the aircraft is moved into the repair engines. A portable taxi lamp for checking the hydraulic systems is also never out of position.

(Turn to page 416)



Above right: Inside planes are laid out of the many pieces of equipment that United mechanics dismantle, clean and put in the Cheyenne maintenance base.

Right: A portion of the engine standup shop. Every 600 hours service is performed on the aircraft engines. The aircraft is dismantled down to the last major part. After being cleaned parts are given rapidly inspected and repaired parts are assembled. Between main run hour bases are not used and position quickly in a short flight before being prepared for a next run.



BUTCH PRICE PHOTOGRAPH

BOMBING OF LONDON

By G. B. Gray

Special Cable to Aviation

THE August 16 bombing of London is like Mark Twain's comment on the report of his own death—grossly exaggerated. At this time the only bombing is a scattered nature, as officially reported, and Cropland Aerodrome which anyhow ought to have been reduced to rubble two years ago, and buildings to melt of London far outside London area.

Nicely countering will not allow details of bombing of Cropland but we may say that German attack of perhaps a dozen dive bombers with strafing fighters came through high cloud without warning and there has been the chance of surprise at Duxford, Biggin Hill, and Germany, whereas before war French used to come up from south. Best news of their progress to those in offices and workshops was hearing of British Number of Aircraft and

wounded necessarily withheld but we saw no large jolting by results at other aerodrome. Equally we cannot specify damage done either in RAF or civil areas. We can say that Cropland is not a first class aerodrome and there are no workshops of leading aircraft manufacturers within many miles from it.

Attack seems to have been realized for use and so Levington area, Paris aerodrome now used as German airbase. My last news says no such English probably in great part because of British firing among French and no promised revenge for Great.

There was no interference with the German bombers when coming in to bomb but Spadans and Hurricanes were already among them before they were out of sight on the way back and none shot down.

Naturally there are many munition works near London including aircraft works well known to Americans and Germans and the London telephone di-

rection but none as first class keepers as in London area therefore London is at least impervious from industrial raid than equal collective acts or indiscriminating raids.

Even as sort of government London is not essential. King Albert refutes South Wales England from Winchester and last year the Duke of Kent government conference have drawn up their basic operating machinery to different parts of the country. Heads of departments and ministerial staffs in London itself are well protected to solid buildings of past centuries instead of mere steel and concrete.

Some critics argue that destruction of small factories would be more easily destroyed probably because they could easily gain individual existence.

All big aircraft and motor plants all parts of country have dispersed plants in other parts. If any one factory is destroyed production will still go on and no factory has yet been destroyed enough to stop production. No factories in parts and complete processes are opening every week and output of prevail effective types has leaped upwards under Boeroeck. Best estimates are that we stand off German output.

No new German aeroplanes showing up yet but some new fighters not identified. We have now tried to predict far enough ahead of existing types to take care of anything they may produce.

Spadans and Hurricanes lead Messerschmitt and Heinkel fighters on recklessness and purpose; though



Pilot and copilot of a German bomber. Note the oxygen canisters.

not so hot as other-day defense. Heinkel, Dornier and Junkers bombers seem least for our fighters.

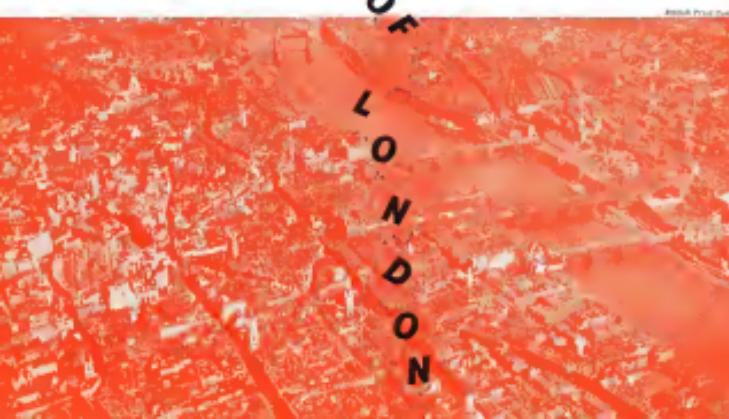
Separately, our pilots and gunners show advantage of knowing shooting and Rangoon and never having been shot down. Armament of fighters, anti-aircraft squadrons going into action part of Rangoon Club sending them onto the field.

Landing in flight station recently intelligence officer called some nice buck gearmen to tell commanding officer that a virgin pilot ignorant in landing from long distance had come in well with Few Measurements out of him. He died for us and pulled up while following German dive right at Spadans wanted to know whether far to claim victory as no that was fired. This seemed a more urgent problem than number of enemies shot down,

which was inherent nature of course.

Fighters are the just two days show who is strong in Germany who arrive in mass. Separate ranks of small numbers make difficult to catch before they start but if Cropland raiders will probably think they are too weak. Rangoon calculations show that if Germans we later were left unopposed they would take about five weeks to reduce London to rubble. Even though we might not even London much they will not be left unopposed.

Remember that Hitler has to guard against invasion of Russia from top to Moscow to losses of France. Of that our ancestors from Scandinavia probably learned a thousand miles a thousand years ago. Watch on start again. And Hitler cannot tell whereabout we have come to stop before starting for Berlin.



BUTCH PRICE PHOTOGRAPH



AVIATION, September 2000

A typical British anti-aircraft battery which did the bombing of London. Here we see a gun emplacement the gunner and gunner's mate in the gun. Key man is the one with the microphone that controls the fire.

IN AMERICA

HOW CIVILIAN SCHOOLS TRAIN MILITARY MECHANICS

The private aviation schools in this country are doing a superb job in preparing mechanics for the Air Corps. This is an account of the air defense program at one school.

By C. E. Westley, President Curtiss-Wright Technical Institute



BECAUSE we have been training boys how to make a living the Curtiss-Wright Technical Institute has become, in a period of ten years, the largest school of its kind in America. Other fine private aviation schools have also prospered and grown, despite the fact that we have a \$40,000,000 public school machine in this country. While it is generally true that we have made progress in the education of the past, the qualified aviation technical schools have kept up with the world's most vital industry.

That is why the U. S. Army turned to the leading private aviation schools of the country when an emergency arose in 1940. The request was for the training of thousands of congressional aircraft mechanics. Our military were resolved that the appropriation of \$65,000,000

(Then in page 105)



Dimensions of the school match those of some complete institutes. Many varieties of planes, engines, and accessories are used toward the 4,000 students.

Above center: Lamprecht engine assembly as possible through the operation of a batch of twelve engine test stands. Complete engine assembly is demonstrated with all its equipment, including starters, governors, main, reverse, and service fuel inventories.

Left: Some of the school's special equipment. This indicates aeronautical modeling paper is mounted in a dry which duplicates the shape and size of the aircraft. This places students before the opportunity of then trying to reconstruct without benefit of the actual plane.



IN GERMANY

NAZI YOUTH ARE TRAINED FOR AVIATION

Training is the primary plank in the Nazi aviation plan. Boys begin with small model planes and proceed step by step until they are flying in Germany's combat airplanes. Here are a few lessons in their education.



Above: Best mechanics you happen to be airplanes, with engines fitted at temple tower by other planes. **Upper right:** Student take machine tools apart until they can do it themselves. **Below left:** Model and after in normal use. Below left mechanics put engine water coolers on a row that was obtained in model planes. **Lower right:** Student pitching beach ball, using one of our high-speed blower.



Research Girds For War



Detailed model measured in the prototype research aircraft.

SCIENTIFIC research in America has suddenly changed its complexion. A new and impersonal necessity has taken the research worker in universities, in industry, and in government. A wholly new point of view is being forced upon him.

By choice and by instant, America's industries have always been geared to a peace-time economy. By far the greatest part of our research effort has been directed toward producing cheaper and better goods than those of foreign manufacturers. Now we are soon spending millions annually to improve our foods, our housing, our cars, and our aircraft. Comfort, safety, and economy have been the objectives. No one could doubt the essentially constructive nature of our domestic research. But others who did not know us so well as the Germans have based on the words for many years, we are just beginning to comprehend something of the tremendous scope and efficiency of the German industries that are now invading our markets. Our industrial separation has been complete. The automobile industry, the aircraft industry, the chemical industry, almost entirely because the programs were carefully planned, well studied, smooth running plans for the production of armament, war equipment.

It is obvious, however, that so much industrial accomplishment over so long a period of time rests on nothing. It is only the result of organization to the nth degree. In the last few years, the results of this organization have failed to live up to what Hitler had in mind. It is astonishing that so many signs should have been overlooked or underestimated.

Germany has always been noted for outstanding scientific achievement in many fields. Their chemists, their metallurgists, their aerodynamicists, have always been of the first rank. Their schools and universities have been centers of research for years. Even during the blight days of the middle twenties, the flow of research was never stopped or greatly reduced. When Hitler took power in 1933, he could have yielded clear apathy as to what Hitler had in mind. It is astonishing that so many signs should have been overlooked or underestimated.

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Talk of airplanes by the thousands has emphasized production problems, but research must go hand-in-hand to preserve the superior quality of our flying equipment. Here are the broad outlines of our plans to enable research to meet wartime requirements.

By S. Paul Johnston, Coordinator of Research, National Advisory Committee for Aeronautics

intended their earliest efforts on forming the firm of research so that when the time came for their great military machine to begin to move, it could do so under a full head of steam.

No great military movement in history was so widely advertised in far advanced as was Hitler's drive across Europe. He has not only sought to show the world what the had to teach than did Germany during the past four or five years. And no people have been as blind to the significance of events that transpired under these very noses as have been the democracies of Europe and America.

For from concealing what they were doing, the Germans in the past few years have openly boasted of their attainments. They have been able and willing to show the world who was going on. Hundreds of visitors to German industry in recent years have been shown the great producing plants, surviving war trophies, guns, and tanks, the great system of roads and railroads through Germany from north to south and east to west, the modern airports and landing fields on a scale far beyond the possible needs of her commercial air service.

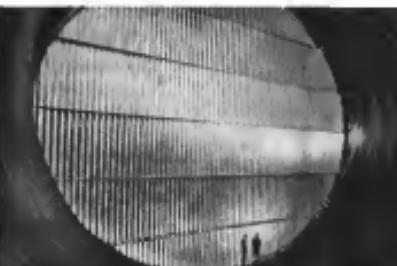
Such things are largely the fruits of research. Looking back, it becomes increasingly plain that all German research in the past decade was aimed toward one objective—namely, the creation of an efficient, all-purpose military machine. What the democracies failed to recognize is that nothing Germany's program over the past decade is the fact that there is no essential difference between peace-time and wartime economies of the totalitarian state. The transition from peace to war does not require any tremendous changes in the defense program. The difference is

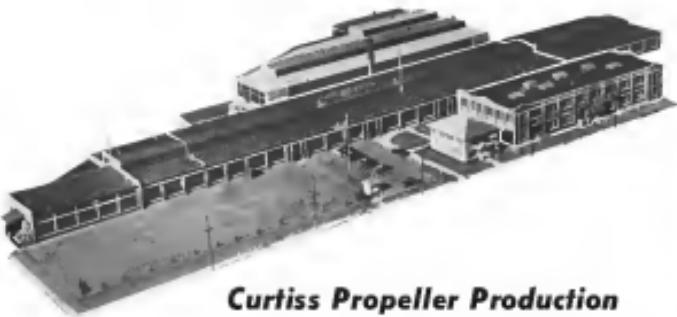
(Turn to page 129)



Part of the research plant at Langley Field, Virginia. Show-like buildings at the left house the aircraft tested. Beyond the center the 200,000 horsepower tunnel, one of the newest pieces of equipment, is the hexagonal, shape that houses laboratories.

On the right research courses at 100 miles per hour, to the function of 800 horses and work in the 200,000 horsepower tunnel.





Curtiss Propeller Production

The Curtiss Propeller plant is one of the key units of the defense program. This is a story of the excellent job they are doing, after expanding more than twenty times their size in two years.

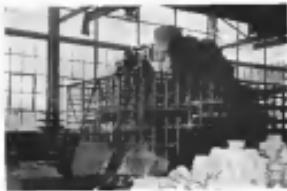


Fig. 1 Machinist Shop Department showing bins and workbenches.



Fig. 2 Research Lab testing Aluminum Alloy blade shims.



Fig. 3 Surface Machine shop Alumilum Alloy blades.



Fig. 4 Casting shop at 42° station with precision.



Fig. 5 Rough Stock Department showing storage bins and power tools.



Fig. 6 Machining Dept. 300° position blade shims from 18° station.



Fig. 7 Postdrill shop automatically drilling blades and blade arms.

ALITTLE over ten years ago there resulted from a pow-wow of Curtiss-Wright engineers what turned out to be the first plants of an extremely critical program. The design department was born to have and to keep the propellers began to fly. Step by step, work progressed and designs were perfected which ultimately led to the present famous Curtiss Electric propeller, being established as a separate more lucrative unit of the Curtiss-Wright Corporation.

Five years of ten years ago—about two or three years ago—brought the comparatively quiet beginning of the Curtiss Propeller Division would result in such a vital part of the present defense program. Making to the more than its share contribution toward the war effort, the company has now reached a production capacity of approximately 17,000 hp at the Curtiss Aeroplane Division of Buffalo and has grown in two years to the present 125,000 hp at Curtiss M. J. plus 35,000 hp at Pittsburgh, Penn. An additional plant now under construction will provide a total of a half-million horsepower when completed near Cicero, Ill., in early October of this year.

The present 3900 employees now are a total of 220,000 mfp. About 1,200 of these men are engaged in actual manufacturing processes while the other 600 are divided up among the engineering, sales and office work. The new plant will make room for 1800 new employees.

A description of the operations of the plant would not be complete without

taking some of the preliminary work that is done before the propeller is actually scheduled for production. Orders coming into the plant from the customer are received by the Sales Department. Prior to the receipt of the order for any engine-propeller combination, all of the necessary performance data is obtained. This is then turned over to the installation department and the technical section in order that the propeller design group optimum performance can be selected (or built) for the aircraft. Models can be designed (or built) if modifications are made with the installation department in order that the same efficient operation can be obtained and the most desirable control arrangement be determined.

When this work has been completed, the sales section is turned over to the Sales Department to do the necessary interpreting and make the quotation to the customer. If accepted, the order is received and the sales order is issued to the Sales Department. Copies of this go to engineering, inspection, manufacturing, distribution and the shipping department. All this is done by the sales department, who then further into the market with the airplane manufacturer to make certain that the installation is correct.

When all of the performance data has been turned over to the Engineering Department and checked, a certain group, comprising structural details of the propeller in addition to the engine, is sent to the casting shop (Fig. 3) where the casting is made up according to the detailed parts numbers and the assembly numbers of the various arms of the propellers. Of course, if the in-

stitution is a new one and not preceding to any standard institution previously designed, it may be necessary for the Manufacturing Department to design new standard parts to meet the special requirements.

Blanks are issued in the Manufacturing Department through the medium of the planning and scheduling departments. This is the heart of the production system which starts out with work orders to the various sections of the production system, including them that do not make up the plant. Along with the propeller, the Planning and Scheduling departments also direct the purchasing department as to the new material required to manufacture production of the new order. Purchasing in turn issues the necessary purchase orders with specific going to the buying department.

Once all of this process has been completed, the shop is ready to start work on all of the material that will eventually comprise the propeller. To facilitate the production, the plant has been divided into six departments, (1) manufacturing, (2) inspection, (3) receiving, (4) sales and service, and (5) metallurgy.

Engineering Department

The Engineering Department is in turn broken down into three sub-departments. The first of these is the Research Department, which is responsible for necessary through an advanced analysis of design of new ships, both in regard to propellers and controls. It is from this group that the pioneering of all



Fig. 3 Read Elmer Altimeter blade after profile.

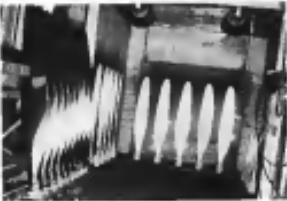


Fig. 4 Blades in polar epoxy bath before assembly.



Fig. 5 Final balance of propeller prior to shipment.



Fig. 6 Final check of hollow steel blade propeller.

various propeller designs is carried out. They are the responsibility of the Engineering Department, which has some 200 engineers and 600 others and have propellers can be improved to make their efficiency increasingly better.

The experimental designs and test section takes the development from the research section and has the responsibility of developing designs with a greater number of propellers per month. The experimental group of this department re-evaluate the standard propellers on the basis of coordinating with the production section to meet any production problems, while at the same time making certain that it is able to pass all necessary tests. The third group is the technical service group, which has the responsibility of policy of blade design and selection from an aerodynamic viewpoint in order that the propellers will be available for new designs of engines and airplanes.

Aerarium Altimeter Blad

The Aerarium Altimeter blade is manufactured out of the Research Standard department (Fig. 1 and 3) against whatever shop order may have been made for that design of blade. These have it stems down through the production line which occupies nearly one-half of the total building (see Fig. 2). The first operation is to center the ends of the blade blade (Fig. 3) so that the tip and the base of the blade and making certain that it is as nearly straight as possible. A Monarch lathe then turns down the end of the propeller

(Fig. 2), cutting the hub close to its outside edge. From here it goes into a furnace to anneal the metal and then comes on the plant. Here it is inspected and divided into the various categories depending upon what type of production is to be carried out on it in the plant. If the material has been completed by a subcontractor, a gear tooth straightness inspection is performed. Should the propeller be in stock, it is further manufacturing by the company, and the raw material has been passed by the receiving inspection department, it is transferred into rough storage.

Aerarium Altimeter Blad

The forged blade blades are manufactured out of the Research Standard department (Fig. 1 and 3) against whatever shop order may have been made for that design of blade. These have it stems down through the production line which occupies nearly one-half of the total building (see Fig. 2). The first operation is to center the ends of the blade blade (Fig. 3) so that the tip and the base of the blade and making certain that it is as nearly straight as possible. A Monarch lathe then turns down the end of the propeller

blades, as held in the correct position by a set screw—the hub hole which is drilled in a Finschel drill (Fig. 7), is then turned into the buffing room to receive the polishing operations that put on almost a mirror finish. This completes all of the straightforward operations on the blade. It is balanced on a balance stand, weighing about 10 pounds a meter blade. Once balanced, the blade is then painted (Fig. 8), inspected, and sent to the Finschel Stock Storage.

Blade Department

The hub drilling is an operation which requires approximately 400 lb. At the Curtis plant 90 machining operations are performed on this hub in about 10 weight of approximately 20 lb., and time is no more than 10 minutes.

The hub drilling of the hub blade has been reprogrammed from the Rough Garage Department (Fig. 4) as is estimated on a large Boehringer vertical boring mill for the first machining operation. In this machine a hole is bored through the center of the hub, where the engine shaft goes. This is the front and outer surface of the hub is then machined out. A machine like blades themselves, however, one time is used for taking the initial cut on the inside diameter of the blade barrel. After this is completed, the hub is mounted on a Bect Planetary-type milling machine (Fig. 14) and the inside and outside of the blade barrel is machined.

The next operation of taking a rough cut from the inside and the outside diameter of the barrel at the same time, is a new method of using the Bect machine. In order to prevent distortion while the hub is being machined, it is necessary to remove the material in small cuts. A middle hole hydraulic machine is used for removing the material from the hub between the barrels. This machine brings the shape of the hub down closer to its actual size.

After all the rough cutting opera-

tions, the hub is sent to the heat treating department where it is heat-treated or being it up to the proper strength. It is after this operation that all the finished machining is done. This finishing includes spinning the hub which is done with a Lappone brush which is pushed through the hole by a hydraulic cylinder. Other interesting point of the finished hub is the removal of the burrs of the core tools. The inside diameter of the face of the hub is Machined, and the face of the hub which is done in order that the necessary clearances can be had. For instance, a clearance of plus or minus five-tenths of an inch of the hub is allowed on the inside of the hub so that the hub can be assembled.

After these finishing operations are completed, a Lathe Gifford drilling machine (with hydraulic feeding mechanism) are used for securing drilling of the small holes in the hub

The drilling of these holes must be extremely accurate as to alignment so that the hub is assembled with the rest of the propeller every fast and well in perfectly. Following this, the hub is polished and sent to the impellers department and does these in the Finschel Stock Storage.

The hub department is located on the upper side of the center aisle, which runs the complete length of the plant from the blade department (see Fig. 15). The head of the hub department is responsible opposite the rough stock department and from there the production line passes down to the point where the hub is finished and is turned directly out to the control assembly department.

This production line is well laid out so that a smooth flow of material from start to finish is able to be achieved.

(Continued on next page)



Fig. 13 Propeller shipping boxes in process of labeling.



Fig. 14 Bect Planetary machining cast hub barrel.

Warplane Factories In Germany . . . Part I

By Paul K. Wilkinsen
Consultant, Diesel Aviation

Production assembly line in a Messerschmitt factory showing the DB 601 aircraft engine under construction. At the far end of the line the F.W. 190, the mobile one being moved to the testbench (left).

THIS warplane industry in Germany has attained such enormous proportions that it is difficult to visualize it in the United States. Where we think in hundreds, the Germans think in thousands of warplanes and a yearly production of 10,000 aircraft would not even begin to play for them. From what the writer saw once when he visited their factories last year Germany has a capacity of 30,000 warplanes a year right now without expanding existing facilities. These factories are not working at maximum capacity but only produce replacement aircraft, fighters, bombers and transports as the war dictates. Despite the need areas, the tremendous production facilities of these factories can be shown in high gear, introductory with indicated supplies of material and trained personnel in their command.

Warplane production facilities in Germany are nearly identical to those to which we are accustomed in the United States. Here we have already copied suitable factories with practically all of the departments under one roof. As a result, our warplane factories consist of single winging stages which would be completely disrupted from the air. Messerschmitt, for example, has not provided space for the storage of materials or proper antiaircraft protection for its factories despite the natural emergency which we call raids.

In Germany, each warplane production factory is a self-contained and expanding massive building spread over a large area, often encircled with barbed wire. Workshops are kept in separate buildings, each containing shadowed and specially constructed anti-aircraft gun platforms and guns are provided on the roof. Subterranean air raid shelters with ade-



Assembly line at a Messerschmitt factory showing the DB 601 aircraft engine under construction. At the far end of the line the F.W. 190, the mobile one being moved to the testbench (left).

quate ventilation and provisioning spaces are located near the buildings to accommodate all the employees deep in the bowels of the earth.

With the exception of Junkers, none of the German warplane factories build their own engines. Engine production has only development work and could serve production if carried on. Small series production comes from a few licensees of foreign engines. The largest engine plant is the 1,200 hp Jumo 211, the 1,200 hp Mercedes-Benz DB 601 and the 1,800 hp B.M.W. 132. In addition, thousands of Junkers Ju 52

airlines of four assembly lines in a Messerschmitt factory showing the DB 109 single-seat fighter under construction. The condenser engine mounts are in the front of a noseplane bay.

Fuselage areas and engine sections of a Dornier Do 131 nightfighter fuselage prepared with Hanomag DB 601 liquid-cooled engines. The armament of the fuselage includes an interlocking machine gun.

Both men and women are employed in aircraft factories in Germany. Here a mixed crew of men and women is shown working in a Messerschmitt DB 601 engine installation in a Messerschmitt Me 109 fighter fuselage. Note the simple visibility room.

Douets of from 700 hp to 1,800 hp have been produced for a special long range bombing fleet. A.M.C.H. engines in Germany are built along mass production lines similar to those used for aircraft and the engine factories are capable for supply for 30,000 warplanes a year.

Messerschmitt Bf 109 ratiocinal bombers are one of the best known German warplanes and many thousands of them are in commission. These planes are built by three different methods at Oberammergau, Erlangen and Augsburg. The later Messerschmitt bombers have a speed in excess of 380 mph with full load and should not be confused with the older models used during the earlier stages of the European war. In addition to these warplanes there are the 1,200 hp B.M.W. 132 single-seater fighters having a speed of approximately 375 mph, beginning to make their appearance armed with two shell guns and a number of machine guns.

friendly rivalry has existed between the designers of fighter planes in Germany and the firm of Henschel and Blohm & Voss, which is considered the world's speed record. In March, 1939, a Henschel He 112 U fighter was flown at a speed of 461.9 mph only

(Turn to page 107)



The Pitcairn WHIRL WING

The new "Jump" autogyro designed by Pitcairn has been a big step in rotary wing aircraft and its readability feature should be of great interest to the commercial operator.

By Agnew E. Larsen, Chief Engineer and General Manager,
The Pitcairn Autogyro Corp.



The Whirl Wing is capable of a vertical ascent from the ground at 12 to 20 ft., depending on conditions of the wind, from which point it "take-off" as shown by the path of the dotted line.

A. E. Larsen, chief engineer, left, and Howard F. Pitcairn, president, of the Pitcairn Autogyro Corp., look over the hulk of the new ship.

THIS recently-announced Pitcairn Whirl Wing Autogyro is an outstanding development in the field of aviation. It is a completely new ship in every sense of the word, and its unique performance characteristics open possibilities in the fields of civil, commercial and military aviation.

The engineering and experimental work that preceded the actual design and construction of this ship, reached back through seven years. Studies were made in this country, and by the German Autogyro Co. in England, of all available present and possible experimental data. The aims were set at developing an autogyro which had the safe flying and slow landing characteristics, and to accommodate the difficult or "Jump" take-off characteristics which have been under development since 1933.

In the preliminary studies for the design of the Whirl Wing, full consideration was given to where the motor

should be located. The advantages and disadvantages of placing of the motor in the nose of the ship or in the center of the ship were carefully weighed. The latter position strongly towards the mid-ship location.

The advantages gained by enclosing the motor within the fuselage, back of the pilot's seat, are numerous. First, the substantial increase in the range of vision for both pilot and passenger were of major importance. Second, the low position of the motor to drive the rotor and the resulting shaft results in less pressure on the front of the engine, permitting the utilization of all of the available horsepower for bringing the ship up to speed. Third, the fore-and-aft loading of the engine could be controlled under all conditions. This third point has several other important advantages in safety operation. Because the monoplane can and does maintain flight at low speeds, the motor, on previous ships, where casting depended on the air speed, frequently overheated. In the Whirl Wing, the use of a drive shaft from central



AVIATION, September, 1941



In the casting system, the air after passing through a hydrodynamic duct is directed by means of specially designed baffle plates "B" around each cylinder head and base.

an air-cooled area for cooling the engine oil. After the air has passed the engine it goes into the rest of the fuselage, and nolets that were carefully located so as to give points of negative pressure, provide means of exhausting the heated air from the ship with a minimum of power consumption.

On the many operating features of the new Pitcairn Whirl Wing, the most important is its method of take-off.

The preliminary ground run has been completely eliminated. From a locked-

whip position it safely jumps vertically into the air to show 25 ft. under moderate wind conditions. This ability to takeoff without any ground run whatever not only enables this ship to clear before, fusion, and similar obstacles, but also permits it to take off from rough or broken-down terrain.

Before discussing any of the other advanced and improvements incorporated in this new ship, a brief explanation of the principles on which this ship takes off may well be given. The preliminary ground run has been completely eliminated. From a locked-whip position it safely jumps vertically into the air to show 25 ft. under moderate wind conditions. This ability to takeoff without any ground run whatever not only enables this ship to clear before, fusion, and similar obstacles, but also permits it to take off from rough or broken-down terrain.

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In this new casting system, air is drawn in through a grill located in a high-pressure area on the nose of the ship. The air is carried through a duct, which passes under the floor and ends in the front casting. There is a small opening in this casting which is used for the transmission unit on the rear of the ship. After passing through the hydrodynamic duct, the air is cooled, by means of specially designed baffle plates, around each cylinder head and bore. A stand of casting radiators is located

directly into the air and projects forward slightly. The height of this vented take-off venturi from 15 ft. in

The compact width of the autogyro is shown in its unique landing gear and tail arrangement. With the engine in the nose, behind the keel, sensitive stability is obtained from the center. An attempt to believe the possibility.



AVIATION, September, 1941



One of the readability features requires a sensitive landing gear. This is accomplished through a system of valves and actuators. "A" is the cylinder in the rear wheel; when motor current "B" flows to the hydraulic line to the hoses

shuts off the flat or nose lift position. While the blades are in this position, the motor can, by means of the rotor drive mechanism, be accelerated to 300 rpm. This is the speed required on the ground. Reducing the pressure in these cylinders permits the blades immediately to "bottom" the few degrees necessary for the Motor to obtain normal flight pitch. Since normal flight rotation of the rotor is only 180 rpm.

(Photo by J. G. E.)

Heat treated to above 400 BRINELL..
yet **READILY MACHINABLE**



NICKEL ALLOY STEELS

For parts which must have high hardness to perform satisfactorily in service, heat treatment before machining can offer distinct advantages. Warpage and distortion resulting from heat treatment after machining cause to be an important factor. Straightening or other finishing operations to correct for such distortion, are eliminated.

Especially interesting are present day practices of airplane part and other mass production plants now machining heat treated Nickel alloy parts mapping in hardness up to 430 Brinell. (above) Stressed Hydrostatic Propeller spiders of Saab 4100 heat treated to a supposedly 430 Brinell are machined with ease on a Ballardish Multi-Arbor in the regular production line at the East Hartford, Conn. plant of Hamilton Standard Precision, Division of United Aircraft Corp.

In a recent demonstration at Worcester Polytechnic Institute conventional high speed tools readily turned, machined, and drilled a 2" dia. bar of Nickel-chromium-molybdenum steel at a feedrate of 400 IPM. The turning cut was fed at 33°/sec. at a speed of 12" per minute. The three helical chip shapes had no tendency to warp, break or burn. The smooth surfaces produced indicate that machining Nickel alloy tools at high feedrates is not unusually difficult.

THE INTERNATIONAL NICKEL COMPANY, INC.

Grumman "Widgeon"



TO CARRY a pilot and three passengers plus baggage nonstop from New York to Chicago at 150 m.p.h., is a pretty good job for any private owner plane. But when such performance can be obtained from a small airplane, it's really worth sitting up and looking at. That means it's up to the users of the German Aircraft factory will rail just such a job.

The new "Wolfeon" is a four-blade helicopter that has been built specifically for the private owner market. With this in view, the operations of the plane have been greatly simplified and it is devoid of gadgets that must be manipulated. The gasoline is a two-engine ship powered with two Ranger motors of 200 hp each. With a cruising speed of 150 mph and 180 gal/hr economy, fully loaded, the cruising range is 750 miles. From all reports, the single engine performance has

shown up very well, and the s
be blown "back off", with either
PROPERTY.

The construction is of typical grasshopper design and does not look a great deal unlike the Indian Gramma "G-1A". The wing consists of a single box bay with two internal spars. The outer wingspan is 30 ft and internally balanced in the center section which contains all the power units. The outer wingspan joins the center section just outboard of the engine nacelles, and all of the spar fairings are faired over in half-tube sections. For the main reason all control surfaces are taken covered. The tail is divided into three main wings with the upper one containing the rudder and the lower one the elevator. It is equipped with a horn-bal and in maneuver and docking, the center cabin which is fitted with large Plexiglas windows and doors, and the tail cone which is easily removable from the outside so that it can be used as a landing skid. There is an auxiliary seat for a loader/pilot or passenger for commanding and observing the landing lights.



New All-Metal Light Plane

WEETH a top speed of approximately 130 μ ft./sec. from a 1-lb.-gross 75-hp motor, a new all-metal, sailplane, manufactured by the Naugle Aircraft Corp., has entered the light plane field. The new glider has recently completed its first flight test which has shown some very interesting results. A few of the performance figures obtained from these trials were a landing speed of from 40 to 42 μ ft./sec., without flaps, and a climb

of 1,800 ft per min. for 1,800 ft, with the pilot the only occupant of the ship.

The test flights were made with a plane having a fixed landing gear and without flaps. Experiments are being carried out on the use of flaps which it is expected to greatly reduce the landing speed. Also a retractable landing gear is being designed and from the test data as far available the top speed of the plane is expected to be about 150

mph and the landing speed to be about 40 mph.

Details of the new plane so far announced. The fuselage is of stressed skin construction with a large window giving excellent visibility. The wings are of a special design being delta-shaped. A somewhat propulsive tail and the hydraulic brakes are manufactured by Shimpo Electronics. Production plans are under way.



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AVIATION September 1940



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AVIATION, November, 1940

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The Junkers Jumo 211

211

By Paul H. Wilkinson
Consultant, Diesel Aviation

Here is a description of the twelve-hundred horsepower Junkers Jumo 211 aircraft engine now being used in the Stuka dive-bombers by the German Air Force.

THE extensive use which is being made of thousands of Stukas (Dive-bombers in SP) dive-bombers by the German Air Force in the European war fascinates us in the power plants with which these warplanes are equipped. That they must be equipped with the latest type of aircraft gear without question seems to be axiomatic. One of the essentials of military equipment is Germany. Junkers Jumo 211 engines are also used in high-speed Junkers Ju 88 bombers and they have been installed in Heinkel bombers and fighters to an appreciable extent. Privately, one notes the Jumo 211 in use with Stuka and it cannot be admitted that the Stuka makes a very effective combination.

The basic requirements dictated upon when the Jumo 211 was designed were high power output at ground level and altitude, low weight, compactness, minimum consumption of fuel and maximum reliability. The set of these requirements have been carried in our engine to quite an achievement and in due to the wide experience which Junkers have had with water-cooled power plants. High power output is obtained by means of a two-speed supercharger, low weight is made possible by utilization of all light materials and the cost of building the engine with its cylinder in an inverted way, economical fuel consumption is obtained by means of direct fuel injection, and reliability is ensured by providing the most rigid inspection control during the process of manufacture.

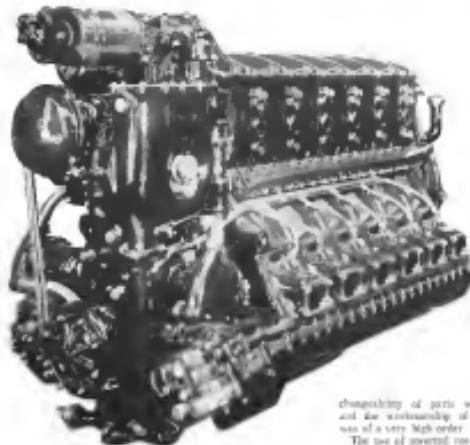
When the Jumo 211 was first produced in 1936 it was rated at 1,025 hp at 5,500 ft. and 971 hp at 13,800 ft., with 1,000 hp available for take-off. Since that time its performance has been considerably improved so

that now it has a rating of 1,200 hp at 6,500 ft. and 1,000 hp at 16,000 ft. and develops 1,200 hp for take-off. The weight of the engine is 1,270 lb. and its specific weight is 1.07 lb. per hp. Thus power outputs are obtained with 40 percent greater efficiency.

After four 120 mm cylinder combustion, the Jumo 211 follows conventional practices. The cylinder and cylinder block are one-piece casting of aluminum alloy with the block set at an angle of 40 degrees. Fuel injection is used on many of the military aircraft engines in Germany and has the advantage that there is no danger of explosion if the engine fails to start during normal maneuvers. It also makes the engine less fuel-sensitive and permits a slightly lower grade of fuel to be used without impairing the performance of the engine.

The two-speed supercharger is mounted on the side of the cylinder block at right angles to the crankshaft of the engine instead of parallel with it in most installations. The impeller is at the high-speed closed-type and rotates in the air through curved vanes around its hub and disappears at its high peripheral speedings around its periphery. The altitude control is in the form of a valve which is controlled by the pressure of compressed air from the supercharger by means of a diaphragm which is actuated by atmospheric pressure which transmits its expansion and contraction to a small hydraulic servo-unit which opens and closes the throttle valve in the air intake of the supercharger. At high altitudes the capsule expands due to the reduced atmospheric pressure and thus causes the servo-unit to increase the pressure of compressed air to the supercharger. The fuel consumption of the engine is approximately 0.45 lb. per hr. per hp when it is cruising at an output of 800 hp.

The valve mechanism is operated by means of a two-speed cam-shaft which has each cylinder head and two inlet valves and one exhaust valve are provided for each cylinder. The valves are fitted with three pressure rings above the piston pin and one oil scraper ring below. The connecting rods are machined from 2-in.-diam steel forgings and have forged bearings of semicircular shape. The connecting rod is machined such that a shell gear can be fitted through it and it is made with a large flange with serrated teeth and holes for eight bolts for attaching the propeller in accord-



The lubrication system functions as

the dry sump principle with an auxiliary feed and two scavenger pumps of different capacities and rates of pressure ranges from 10 to 30 lb. per sq. in.

Water is used as the coolant and is circulated by a centrifugal pump with a cooler header tank across the front part of the engine. The tank is of a coolant instead of ethylene glycol which is used in most liquid cooled engines.

The Jumo 211 is an air-cooled engine and quickly removes heat by means of a cooling system consisting of a cooling coil and a fan.

Accessories provided for an electric generator, an air compressor or vacuum pump, a dual-driven and an electric tachometer and two machine oil synthesizers.

When the engine was the Jumo 211 in mass production in the Junkers factory in Germany has yet to see particularly notable that rigid inspection control was maintained during all stages of manufacture. Even the component parts were tested with Roentgen rays to ensure that the material was satisfactory and the micrographs of each part were taken and checked by experts. Much of the inspection work on small precision parts was carried out at air-conditioned rooms with up-to-date electrical and optical apparatus.

changability of parts was another and the workmanship of the engineers was of a very high order.

The use of inverted non-type engines such as the Junkers Jumo 211 and the Mercedes-Benz DB 601 for high-performance warplanes in Germany is in sharp contrast to the use of upright non-type engines such as those used in the United States and the Rolls-Royce

(Turn to page 122)

Diagram of circumferential water cooling system of Junkers "Jumo" 211 pass has already begun.

The following quantities correspond to the location on the drawing:
A—outer water jacket; B—cylinder block; C—header tank; D—water return pipe; E—radiators; F—centrifugal pump; G—auxiliary tank; H—waterflow return pipe.



DEEP DRAWING OF METAL AIRCRAFT

PARTS with the

H.P.M. FASTRAVERSE *Triple-Action* PRESS

H.P.M. designed and built the first hydraulic triple-action metal working press. Today H.P.M. Triple-Action Presses are widely used by the metal working industry.

One of the first aircraft manufacturers to discover the many advantages of the H.P.M. Fastraverse Triple-Action Metal Drawing Presses was Douglas Aircraft Co. This company recently installed a 400-ton triple-action Merchantile press for deep drawing gasoline tanks and other similar aircraft parts.

Important exclusive features of H.P.M. Triple-Action Fastraverses are:

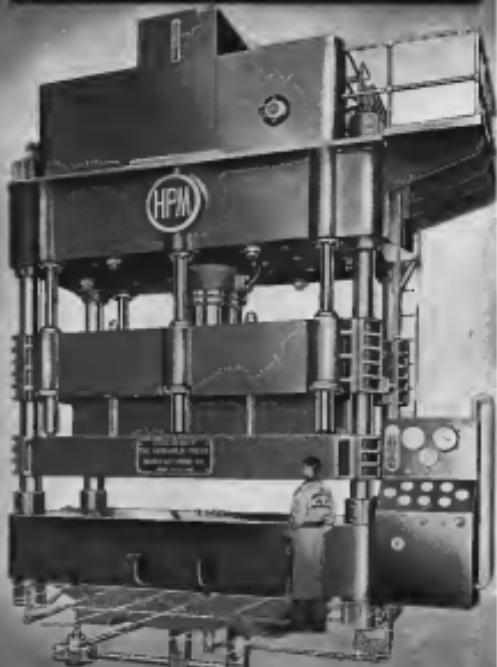
Air-cooled Merchantile die may safely support a Merchantile sheet directly above.

Individual pressure adjustment of each Merchantile die may accommodate the variation of Merchantile pressures of all types of metals.

All three hydraulic systems function from only one H.P.M. Hydro-Power pump-type rated power directly generated by one double-revolving unit in one electric motor.

H.P.M. Closed Circuit operating system prevents contact between tools and valves and die blocks press reversal.

The H.P.M. Fastraverses Press is the only press which can perform your deep metal



THE HYDRAULIC PRESS MFG. COMPANY, Mount Gilead, Ohio, U. S. A.

District Sales Offices: New York, Syracuse, Denver and Chicago
Pittsburgh, Akron, Cleveland, Cincinnati, St. Paul, Seattle, San Francisco, Los Angeles

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Foreign Representatives: Canada and England



The Culver Cadet

THE Culver Cadet's range of 600 miles and maximum cruising speed of 120 mph is aimed at opening up many new flying possibilities for the private pilot. Many comparatively new features for lightplanes are incorporated in the design. One of the most unusual is the main nose being the retractable landing gear which enables the plane to attain a speed of 180 mph. A slanted wing is also incorporated which provides better lateral control at low speed and increases the size of landing.

The Model L-2A is a two-place, low-wing monoplane powered by a Continental flat-six engine of 115 h.p. and rated at 75 h.p. The fuselage is of auto-monocoque construction with a stressed skin covering of reinforced plastic-type material. The cockpit is enclosed by Pyreneh and doors are provided on either side of the cabin. There

are forward and prevent entrance as well over the wing root. The seating arrangement is side-by-side and dual stick controls are provided.

The wing structure is of the monocoque type, the main shear spar being of constant section and the outer spars being of variable section to take the entire bending moment and shear resulting from air loads. The wing torsion is transmitted to the trailing edges by means of a chrome-molybdenum steel torsion tube which is located between the main shear spar and the rear auxiliary spar. The wing is of the full cantilever type. Trailing edge flaps are located near the wing tip. The leading edge of the wing, in front of the main spar, is of plywood construction, and the whole wing is aluminum-tipped. The fairing of wood construction. The tail section is a cantilever type, utilizing

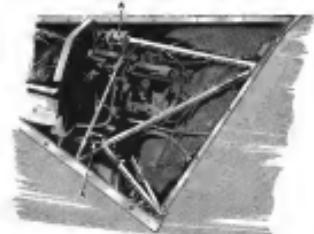
a common elevator provided with a trimming tab.

The retraction of the landing gear is accomplished by means of a mechanical operation through a wheel located in the cockpit between the two occupants. The gear is held in the down position or lower than gear. In its extended position, each of the individual legs of the gear is fully enclosed by a fairing. (See page 427)

Y Flying EQUIPMENT



The cabin of the Culver Cadet has ample room for both pilot and passenger instruments are placed so as to be easily read by the pilot. Seats are covered in dark colored upholstery. The roof is ribbed and has a door enabling passage into the rear with sides modelled of Plytex.



The rearward motion suspends the motor by vibration absorbers "X". The heavy tail section of the plane extends back to fifteen in. to the leading edge. The tail section is a dural casting extending past the rear giving extra strength.



Presenting the New

GRUMMAN "WIDGEON"

Five Place Twin-Motored Personnel AMPHIBIAN

GILLIES AVIATION CORPORATION
Bethpage, Long Island

Aviation's Potential Profitless Prosperity

By Selig Altschul

COKE what may, it is well admitted that the aircraft industry will not wait for lack of business in the immediate future. Last month, however, is what profit margins, if any, may prevail in the industry. It is this month that the aircraft has around its neck as view aircraft executives will all open their eyes in an attempt to appraise all possible factors.

The excess profits tax bill resulting from a compromise between the supporters of the Treasury and of the joint congressional committee, may at least temporarily overshadow factors being the current industry.

Encouraging is the provision calling for the suspension of the various Transoceanic Air profit restrictions on ships and aircraft contracts. This Air has long served to discriminate against ship yards and aircraft builders. The present excess profits tax would tend to regularize relations, assuaged all concerns concerning the national defense programs.

An important forward step is the special amortization plan for defense plant expansion. It is proposed to allow those industries which have expanded their plants and separated new equipment from old, \$10,000,000 in the President's defense program, to amortize the cost of the expansion over a five-year period or even a shorter period of time if the emergency ends within the year.

The excess profits tax provisions proper, both promise of providing some a stimulus to corporate investment and encouragement of defense expansion. As far as the aircraft industry is concerned, a company has the option of calculating its excess profits tax exemption, either on the basis of its average earnings for the years 1936 to 1939 inclusive or on the basis of average earnings for the years 1936 to 1939 inclusive. Both methods of calculating the excess profits tax are the same.

The inverted capital provisions of the tax schedules of the last year raised lengthy and involved questions which were not settled for years. Apparently this provision is again justified in an attempt to mitigate for those companies whose profits tax liability would have been increased, the severing of a heavy hand solely upon average profits for the designated late years.

The excess profits tax bill as it now stands would severely affect the aircraft companies. Generally speaking, the aircraft builders expanded rapidly dur-

TABLE I
Improvement in Aviation Operations
First Half of 1939 Compared to
Like 1938 Period

| Region or Month | Passenger | | Freight | | Total General | | Passenger | | Freight | | Total General | |
|------------------|-----------|---------|-----------|---------|---------------|---------|-----------|---------|-----------|---------|---------------|---------|
| | Passenger | Freight | Passenger | Freight | Passenger | Freight | Passenger | Freight | Passenger | Freight | Passenger | Freight |
| Region - Midwest | 41 | 17 | 11 | 10 | 52 | 20 | 10 | 10 | 10 | 10 | 10 | 10 |
| Month - January | 41 | 17 | 11 | 10 | 52 | 20 | 10 | 10 | 10 | 10 | 10 | 10 |
| Month - February | 41 | 17 | 11 | 10 | 52 | 20 | 10 | 10 | 10 | 10 | 10 | 10 |
| Month - March | 32 | 1 | 10 | 2 | 43 | 11 | 10 | 10 | 10 | 10 | 10 | 10 |
| Month - April | 30 | 10 | 10 | 10 | 40 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Month - May | 30 | 10 | 10 | 10 | 40 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Month - June | 30 | 10 | 10 | 10 | 40 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

ing the best period designated with earnings showing a sharp peak in 1939 Midwest, in my opinion has been unable to have developed inverted capital to the extent where it could obtain maximum benefit from the present and expected expansion of earnings. The inverted estimates have indicated that in the case of certain major aircraft builders, profits before taxes would need to be approximately one-third larger than last year in order to finish with the same net profit.

However, the representative companies for 1938 are on their way to at least double last year's profits on a normal basis; the new excess profits bill does not appear too burdensome. While the government would obtain a substantial share of the increase in corporate profits, the aircraft manufacturers would not be prevented from making money.

An aircraft executive has never fully discounted the high profit returns calculated early this year that they are less susceptible to my drastic market fluctuations. In fact, even after consideration of the drastic effect the new tax law would have on the aircraft industry, we are only five leading aircraft manufacturers content to sell at a low rate in which no anticipated earnings after tax deflections.

Less fortunate is the air transport industry as its status under the proposed excess profits tax left. This

growing industry did not have its first profitable year until 1936. Using the 1936-1939 period as an average, it is found that the industry as a whole, was hopelessly in the red. Obviously this is a very unsatisfactory base from which to predict earnings under the new tax law. Apparently, the inverted capital system, it is found that the airlines are equally in a bad way. Total assets for the industry amounted to only about \$47,000,000 in last year. With substantial plane acquisitions currently being made, the airlines will need to raise their earnings per share in order to help pay for such purchases.

The Air Transport Association has recognized this problem and its president has asked for complete exemption for the airlines from the provisions of the pending bill. The extension of the tax to the airlines is the only part of most of the air transport as required by the Civil Aeronautics Board there is no need to apply the excess profits tax to that group.

With complete figures available for the air transport industry's record-breaking first half, proper interpretation of the relative accomplishments of the two groups can be made.

The growth factor continues to be very pronounced in the case of all manufacturers and for the industry as a group. Table I shows the increases in terms of percentages only for the first six months of 1939 as compared to the like period in 1938. An examination of these figures clearly shows that the two groups represent a significant portion for the industry as a whole.

American and Eastern reflect the benefit of additional ships in service than purchasing more schedules, however the largest increase in revenue passenger miles was American. According to TWA, however, American and Eastern reflect these facts, it was in a lesser degree than American and Eastern.

The sharp increases in revenue-passenger-miles shown by both Pennsylvania and Northwest, is primarily due to the replacement of smaller equipment by the Douglas DC-3. The "big four" also improved their load factors than showing an increased rate of increase in revenue-passenger-miles shown as contrasted with the improvement in revenue-miles shown. The inflation of the "Stereotypes" in (Turn to page III)

FOR MODERN RECONNAISSANCE

...Today's Military Aircraft need this RCA Equipment!



*Location of Transmitter, Receiver and Retractable Antenna in fuselage and Parelli
Operation. Unique construction of Antennas prevent aerobatic abuse or ground.*



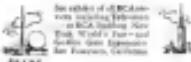
*Efficient, lightweight RCA AVR-30 Trans-
mitter/receiver weighing only 33 pounds
with antenna system and antenna. Built-in
Remote Control.*



*3 Position 360° with radio controlled landing
or takeoff which automatically disconnects
to the RCA APR-30 through Remote
Control to 6000 feet above sea level. Easy storage.*

*For dependability, it pays to use the radios
powered by more airports and planes—*

RCA RADIOPHONICS



*In addition to the 1000+ stations in the
U.S., RCA Radiophonics has more than
World's First and
most extensive international
operations for Broadcast, Television,*



*Quickly retractable and light-weighted
in its ground-only RCA APR-31
Retractable Antenna offers long life of
stainless steel and low drag. Minimizes
aircraft noise load operates by itself.*

FOR AIRBORNE SERVICE, as much as
any other service, today's high speed
planes demand flexibility, highly reliable,
light weight communications equipment
—and the RCA answer... ready
now for delivery from stock, available
for export, and readily adapted to all
types of aircraft needs!

RCA AVA-41 Retractable Antenna System combines the efficiency and longer range of a long trailing antenna with the convenience and low drag of a short fixed antenna. New type of relays can be retarded with a fraction of a turn only when flying speed is attained—preventing accidental release on the ground. The short stage communication between pilot commanding in the plane need not be discounted—an adequate short range signal is retained even with the antenna retracted.

RCA *for Aviation Radio*

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Air Show display at Bangkok airport, starting a series of stories on Southeast Asia.

AVIATION MAKES PROGRESS IN SIAM

With World Politics focusing new attention in the Far East
theeronautical situation in Siam is of timely interest.

By Lucien Zacharoff author of "This is War!" Associate Editor, Aircraft Publications

IT is sometimes difficult to realize to what extent this world of ours is in the grip of a闻deration, both as war and peace, when one considers the advances made in recent years in such small and out-of-the-way countries as Thailand—also known as the Kingdom of Thao-Wang-Thai in its native, and Siamese, name language.

To many, Thailand is a country and military importance is deserved alongside the civilian facilities and resources of the great Americas and Europe powers. However, the flying strip there is up to the minute and

most impressive when one remembers the size of the State country and its irreversibility for short air traffic in technologically undeveloped Southeast Asia.

A glance at the photographs illustrates this article will convey the idea that while Thailand, one of the last absolute monarchies, may not be the last word politically, it is keeping up with the flying progress of the world.

Since warlike preparations for it permit the atmosphere of all comment, let us first survey quickly the status of military aviation in the realm. Per-

haps leading in the Royal Armed Services, the Royal Air Force had been formed from the Army some time ago and is now under the direct operational command of the Minister of National Defense. In Command-in-Chief is Group Captain Phra Vajira Rangsit.

Although there are no major aircraft manufacturers in Thailand, the Air Force claims an such importations as the Curtis Hawk, Vought Corsair, Martin B-57 and Avro 544 N, are military workhorses holding exports. (Turn to page 119)

8. Initiation of trans-oceanic nonstop route to the Southeast capital.

Photographs by P. P. White





NATIONAL DEFENSE FINDS REYNOLDS METALS READY!

Reynolds Metals, an accredited source of supply, is ready to handle the aluminum demands of the Aviation Military Program immediately!

Months ago, we readjusted our vast production facilities so that aircraft assembly lines would not be slowed down by a shortage of aluminum bars, rods, shapes, tubes or sheets. We readerd our engineering staff to tackle the particular and exacting problems of aluminum as applied to aviation

and to furnish practical solutions to them quickly. Today, any aircraft manufacturer, military or commercial, will find a new source of supply and expert engineering assistance here at Reynolds Metals. He will also find skilled production facilities for the rolling or preparing of aluminum plates. We would welcome an opportunity to talk shop with you. Reynolds Metals Company, General offices—Richmond, Va. . . . Sales offices in principal cities.

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AIRCRAFT, October, 1940

THE PRECISION REQUIRED FOR MODERN INDUSTRY

South Bend Lathes are designed and built to provide the extreme precision required in modern industry. They are giving tool room accuracy on close-tolerance production work in hundreds of manufacturing plants throughout the United States. The smooth, vibration-free belt drive to the spindle proven from years of use, boring with such precision that subsequent grinding, honing or lapping operations can often be eliminated.

South Bend lathes are made in 9", 10", 13", 14½" and 18" swing, in 3' to 12' bed lengths, in Motor Drive and Counterbalance Drives.

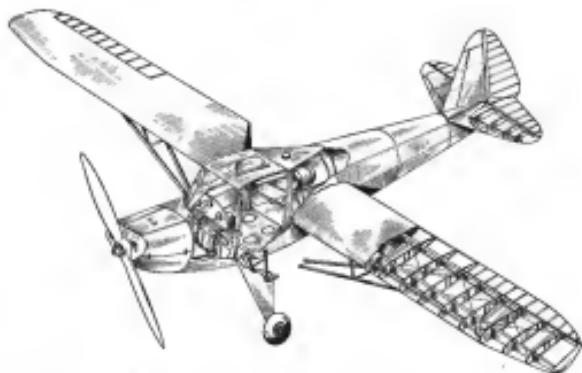


SOUTH BEND LATHE WORKS

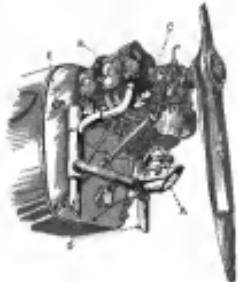
LATHE BUILDERS SINCE 1906

181 S. Madison St., South Bend, Ind. U.S.A.

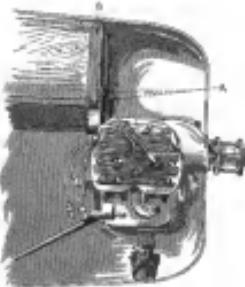




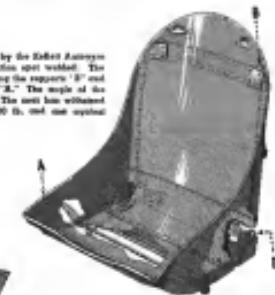
The fuselage of the Aeromotors model AA is of semi-monocoque skin construction. It is built up of aluminum alloy sheet with aluminum alloy stiffeners. The front tail surfaces are of monocoque skin construction, also with metal ribs. When one of these is damaged it can be repaired from the outside. The rear tail surfaces are made of wood and are strengthened by a special gluing that prevents separation parallel to the ship stresses, and use of metal transverse ties. The rest of the cabin has a skeleton built in with the car tank directly behind.



The new Aeromotors model 10-51 and 15-51 have the new exhaust system shown at the left. "A" is the convector air inlet group which incorporates a valve that can be opened from the outside. In the center is the main intake that connects to the exhaust bell pipe. "B" can be rotated directly to the bell pipe. "C" is the slot in the convector housing below the engine heat extracting the engine noise.



The engine mount of the Dornier 18 is made of light metal and wood casting box. The bracket "A" on the bottom of the side and the sleeve slide support the engine from the mounting. The sleeve slide supports are strengthened to take the loads indicated. "B" is an oil plane made up of 1/8" with three ply material. "C" are new propeller mounting members of 1 in. by 1/8" in square. Brackets "D" are 1/8" long three in. wide, placed on both sides. "E" is 1/8 in. by 1/8 in. square member and "F" is a 1/8 in. by 1/8 in. square member. "G" is 1/8 in. by 1/8 in. square member.



The pilot's seat designed and built by the Robert Antonius Corp., is of 14-02 Alford construction spot welded. The seat can be adjusted vertically along the supports "H" and other adjustment handle "I". The angle of the back can be altered to 125 degrees. The seat has without a vertical decompression load of 4000 lb. and one vertical the back at the seat of 1115 lb.



The front wing was incendiary load of the Messerschmitt Bf 109. Front section of two 26 gallon gasoline pressurized tanks and filter galvanic. Gas line through blind index coupling between lead open and closed tanks and the tank carrier. The engine is located between the gas tanks for shielding at its rearmost.

Aviation RADIO

Dialing the Air Waves with Don Fink



Transmitter-Receiver

The latest trick at making battery-operated transmitters easy to use is that announced by Taylor Avionics Products of the Long Beach, Calif., Airport. The standard Model 421 transmitter and BT-4 receiver have been improved in a rugged-type carrying case, measuring 10 x 12 x 16 inches, and weighing only 10 pounds. The control panel at the top of the case permits tuning over the selected beacon band, (770 to 430 kc.) adjusting the antenna load, volume and signal switch. Radiation is indicated by a daylight lamp. The power supply



Taylor's pick-up transmitter receiver.

with standard batteries is 3 watt, but 1-watt operation may be obtained with two sets of batteries. The press-to-talk button on the microphone permits all switching operations. The range is 25 miles when used with an omnidirectional antenna. The weight is 12 lbs. and the dimensions are 10 x 12 x 16 inches. The price is \$125.00. It is for the classic battery type. Normal battery life exceeds 100 hours. Two phone jacks are available, with sufficient induction between them to make the switch useful in station automation or for automation. The crystal usually furnished is 1,015 kc., but other frequencies are available on order.

This equipment, with its unique carrying case, should be of special interest to the private plane operator not wishing to go into beacon use.

U-h-f Equipment

Two complete pieces of equipment for u-h-f communication have recently been announced by Radio Receptor Co. The Model 421 transmitter is a u-h-f unit for airport mobile control. The frequency range, 135 to 150 Mc., has been modified so that it can be used on either the 100 watt, regular or 100 per cent modulated amplitude modulation. The radio frequency characteristic is the written 3 d. loss (180 to 4,000 cycles), and the distortion at 400 cps is less than 5 percent up to 90 percent modulation. A "tune-operate" switch is provided to leave the plate voltage alone during adjustment. This is designed to prevent cable noise and requirements for excessive filtering. The transmitter operates directly from a 115-volt 60-cycle line, and is housed in a single cabinet robust 76 in. high, 24 in. wide and 36 in. deep.

The series 424 u-h-f receivers are intended for airport traffic control and mobile communications. Three bands are available in different matching: 60 to 65 Mc.; 123 to 126.5 Mc. and 140 to 144 Mc. (like recent action of the Federal Communications Commission in changing the band from 60 to 65 Mc. in television has re-

versed the u-h-f status of the first named band). Model 424 can be supplied with the first two bands, Model 424A with the second, and Model 424B with the last named. The sensitivity is said to be 10 microvolts, and it is produced with 5 microvolts input, 90 percent modulated, with 35 db signal-to-noise ratio. The selectivity is 5 db down at 40 kc. band width and 60 db down at 200 kc. Image and spurious responses are down 60 db. The audio output, 5 watts maximum, covers the range from 100 to 5,000 cps within 3 db, and the distortion is 5 percent at constant voltage 3 db from 50 microvolts to 100 millivolts. Three Type 993 wave filters are used in the u-h-f circuits, and a total of fourteen tubes is used in all, including a voltage regulator tube. The net weight is 27 lb. The receiver is housed for rack and panel mounting.

BTM 5-kw Transmitter

The most powerful surface ground station transmitter yet used in this country, having a power output of 5 kw., and being supplied by United Aircraft by the Federal Telegraph Co., Elkhorn Park, is to be installed at Laguardia Field, New York, Chicago, Cleveland, Denver, Los Angeles, Oakland, Portland, and Salt Lake City. Each transmitter is built in five to six sections, including power supply, modulator, oscillator, and two or three rf stages. The frequency range is from 1,000 to 15,000 kc. According to engineers, all of the transmitting tubes, and the equipment is arranged for field accessibility from the front panels so that no waste space is needed at the rear.



UHL 5-kw ground station installed by Federal Telegraph.

Already Enlisted for Hemisphere Defense

★ ★ ★

Back when "Hemisphere Defense" was a mere prophecy of the Monroe Doctrine, Ryan STM primary military trainers were doing pioneer's service in the air forces of Mexico, Guatemala and Honduras. As soon as "Hemisphere Defense" became a reality challenge to the U.S.A. these modern dual low-wing trainers were enlisted in the U.S. Army Air Corps. Completely equipped in meeting the demands of Ryan, they are now making a permanent role in the Army Cadet Training Program. Ryan Aeroplane Company, Lindbergh Field, San Diego, California.

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As the issued primary military trainers, Ryan STM's fly the warplane markings of many progressive nations.



Improved GAP SETTING TOOL

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SEPTEMBER 1940

Right: History in the making. In the rear of the car, left to right, are Generalissimo Franco, Major General Macmillan, and General Macmillan of Canada, Army of West Africa. They are reviewing 107 U. S. little planes at Fifeville, N. Y., during the war games, and are discussing American defense plans, whereby U. S. and Canada act together to establish air bases.

Lower right: Possible paratroop jumps at Wethersfield, N. J., where men from the U. S. Infantry School at Fort Devens, Mass., are training in the art of jumping. Unlike the "stow jump" at the World's Fair, these fall freely from the 100 ft. tower. The use of the tower can be removed, permitting troops to drift away from the base.



The Industry and Administration Reach Agreement Start Huge Airplane Building Program

Washington (AP)—After weeks of nervous delay and uncertainty, aircraft manufacturers finally decided to sign contracts for production of most of the 4,269 planes promised by the government. The decision was provided in the first defense appropriations bill this group of orders can be handled with one aircraft plant under contract alone, the industry agreed to go ahead without waiting for enactment of the emergency and authorization legislation.

Senate Armed Services Committee, on the first to sign, on day one of award of \$11,354,831 for 200 trainers. Within a few days Patriotic Engineers, a consortium of 100 firms costing \$14,269,330, will Consolidated Aircraft, Inc., awarded \$10,811,312 for production of 90 four-engine bombers. Both Aircraft Corps signed up for 87 training planes at \$1,418,795, and Boeing's Stevens Aircraft Division, for 231 trainers, totaling \$1,411,845. Some half-dozen additional con-

tracts pending at Wright Field were expected to be entered before the end of the month.

In complete had the bill been in operation last year, the war work of aircraft manufacturers available, contracts were let for nearly 30 planes. Early in July the decision had been reached to go ahead with the program, but by now, moreover, and the manufacturers had been notified of their allocations. Moreover, the administration's Congressional liaison branch had announced that Vought-Trotti and Northrop divisions would be lifted and authorization of new facilities permitted over a five-year period.

Senate, however, insisted that these changes be incorporated in one general cross-protective measure when everyone knew what the final bill would be.



NATIONAL Aviation

Gravity Point Progress

Down the Potomac a week ago there are rising asphaltic emergency runways and making headway toward the new Greater Point national airport. Headways, about \$1,000 D., will be made by now in late October, but the temporary buildings will be gone by the end of November. The date of beginning operations is not yet certain. There will be no hangars, but a bill of parts, "Couriers for aircraft," have been issued. Each of the three firms serving Washington (PCA, AIA, and EAL) says they want two hangars, and other firms—subcontractors—will be added to the picture. There is talk that maintenance will be suspended at the point, which is equivalent to the north-south stretch. Some of the temporary buildings and features of any airport in the world will be set at Greater Point. Airlines will tell all about it at a news meet. The date of the first flight will be set some time next month. After all of the talk about steel buildings at the field for GAA at the 1940s, as if the 1940s were never there, they have no representation to speak a word.

Major construction at the field has been started by Jacobs Brothers, of North Carolina, contractors, and the Gulf Oil Co., their interests offering most favorable propositions on bid basis.

Amortization Speeded

Bet Profits Tax

Washington (Continued from page 1) The tax amortization legislation has a long way to go before it reaches the President's desk. The Senate version of the original draft was already being discussed, but others are taking steps to get it passed. The Senate version of the bill would permit amortization of profits for tax purposes, over a five-year period, and could tax "excess profits" at a rate ranging from 25 to 40 percent.

The Senate version would apply both to companies the excess profits tax and ordinary income tax. The point of amortization may be shorter if the emergency is terminated by the President in less than five years; the amortization may be refigured retroactively over



Photo license No. 1 was awarded to Orville Wright, center, by Edward P. Warner, right, at the induction of the new Wright Memorial at Dayton on Aug. 18.

last listed on Washington. Miss Cecile Houston is an editor of the DC office and she also does work for NAA. Mrs. Edith Gilman, president, is not present to Washington. The White House has been asked to loan her a plane to bring her home. The pace is slow. Headquarters keeps employment files on members, researches them, sends circulars to associations and public relations, etc., as needed, etc., etc., etc. Good plans to look for employment with aviation enterprises.

A new organization, Women Pilots of America, has been organized in the East. It is a training unit, not competing against the National Organization. Women studied physical needs and will be a source of recruits for the service. A similar group will get organized in the West. Reference courses will be given. About 5,000 female pilots who took about 25,000 applications for reference courses have been recruited from those who have left the service.

Research laboratories of 26 universities are studying methods of selecting and training flyers, hoping for improvement of techniques.

New It's 50,000 Pilots

Washington (Continued from page 1) The pilot training program of CAA is judged by nearly everybody to be a big success, almost no criticism has been made of it. The director is the Honorable Secretary of Commerce, Robert H. McRae, his chief assistant is given unreserved credit for his work. The work is done under the supervision of the Administrator, Col. Frank J. Whaley and Sheldon Hand.

The enforcement program of the bill recommended that the defense orders cease before the manufacturing facilities are taken over by the government. This has been done, but the manufacturers have to be monitored to shape up production on a steady basis, after being selected. This is being done by the Defense Comptroller.

The enforcement program of the bill recommended that defense orders cease before the manufacturing facilities are taken over by the government. This has been done, but the manufacturers have to be monitored to shape up production on a steady basis, after being selected. This is being done by the Defense Comptroller.

The bill repeals Wartime Transportation Board or profits of ship and plane manufacturers and establishes an excess profits tax applicable to all corporations engaged in the manufacture of aircraft, defense or otherwise. The first \$100,000 of excess profits is taxable. Thereafter a tax must be paid varying from 25 to 40 percent, depending on the

grossed added earnings of the corporation, plus a small weight-disability will award \$100,000,000 to double its productive capacity. The bill also provides that the financing will probably be carried on with private capital and which will bring up their excess production. In about 12,000 engines a month. Weight-disability will award \$100,000,000 to double its productive capacity. The bill also provides that the financing will probably be carried on with private capital.

CIO-BAM Organizes Plane Division

An intensified drive to bring aircraft workers into CIO's United Auto Workers Union is being conducted. A plane division has been formed in UAW headed by Walter Baumhart, a CIO organization director, who came up through the miners.

New Airport Program

GAA, War and Naval officials strengthened through endless meetings to draw a new airfield plan for the country. At this time, the Air Corps, the Navy and the Army are working together to make these studies.

AA Corp was concerned about the lag between Seattle and Alaska which was too long for general planes. But the new field at Midway, on Seldovia village in extreme southeast, cuts the passage to less than 600 miles, which is not bad. Canadian meteorologic parts are available, but Army doesn't like to depend on the good graces of a neighbor.

Coyote and Eagle would split the present path of seaplanes and land planes. Coyote would be used for passenger flights, and Eagle for cargo flights. Both of these will remain the property of Japan and Russia, according to the terms of the peace.

Hopied boats Germany with airplanes alone, the old theory that planes cannot take off and land well will be exploded, and the practice of aircraft as weapons will go still longer; we will go the practice of cause.

There is no agreement among CAA, War and Navy officials whether in emergency the air armada should be directed to give to the civilian planes and planes. But as far as War and Navy are not agreeing to expansion of air transport.

Instrument landing experiments on the two stations in use are showing satisfactory. Although the cost of equipment is high, the instrument pilot's mind is open to the future. It will be at least a year before any subsidized flight landings will be made, maybe more.

The Shubeloff Award this month goes to Gen. Ben Kline, former commander in chief of Strategic Air Forces, who says it would be very difficult to attack the East with planes because of "the rocky roads and unattractive air pockets which surround it."

Assistant Secretary of Commerce for Air, a title once worn by Bill McCrindle and Clarence Young, was said to be still vacant and would remain on the books of Mr. Hinsley, until the end of the year. McCrindle was a distinguished Air force man. Mr. Hinsley's responsibilities include the Weather Bureau, in addition to aviation.

July passenger traffic on domestic air lines stabilized a new peak for the 1943 comparative month, while the gain over July, 1942, amounted to more than 50 percent. Further gains are anticipated up through October and the year's total may exceed one billion passenger-miles, as compared with 975 million in 1942, the last pre-war year.

Congress Directs to Investigate the airlines for failure

to make short-hauling schedules and not warning passengers in advance.

THE WASHINGTON WINDSOCK

by BLAINE STUMBLEFIELD



to the industry to do its best. The new peak will absorb about 3,000 legs, measured at 200 miles. Some of the legs have big wheel loads up with vicious surfaces that keep slipping like runners. Also a new leg has been found in the back-stage areas, with a 300-mile limit.

You may be required to hear a report that the Army is just now getting around to a survey of the field and other facilities which could be available in South America if the U.S. were called to help defend one or more of these countries. It has had only three or four years, we are told, since the Air Corps began stages. Take on the way to the Amazon. The Amazon is the largest river in South America and the personnel to make these studies.

AA Corp was concerned about the lag between Seattle and Alaska which was too long for general planes. But the new field at Midway, on Seldovia village in extreme southeast, cuts the passage to less than 600 miles, which is not bad. Canadian meteorologic parts are available, but Army doesn't like to depend on the good graces of a neighbor.

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Calling Names

Arnold W. Knobbe—In the past 20 years, T-33s have been built at the plant in Wichita, Kansas, by the Air Force, the Navy, and private firms.

Arlene Hines—Wanderer in the sky, she has been a flight attendant for 10 years. She is now a member of the Air Force flight crew.

Gen. George E. Stratemeyer, Director of Personnel, Defense Department, has been appointed to a three-year term as Chairman of the National Commission on Civilian Defense.

William M. Knobbe—T-33 pilot for 10 years, he has also been a flight attendant for 10 years.

Joseph A. Schlesinger, former attorney for the U.S. House Select Committee on Hearings on War Powers, is a Washington lawyer.

Howard W. Morris appointed professor of history at the University of Washington.

Winged Aviation, a new program by the U.S. Army, Navy, and Air Force, will stimulate the development of amateur aviation.

Warren S. Beatty, appointed chief executive of the National Aerospace Council.

April Ellsworth, son of a cattleman from Texas, who is an American citizen, was one of the 100 Americans who became martyrs.

OFFICIAL AIR FORCE ASSOCIATION, newly organized, held its first meeting on Sept. 10, 1950, for veterans.

Marvin Thompson, appointed senior vice chairman of the American Legion.

CAM announces plans with major aircraft manufacturers to expand their associations by consolidating.

C. E. Wrenn, Chairman of the Board of Directors of the American Society of Motion Picture Engineers, is a member of a panel to discuss motion picture problems.

Major G. H. White, US Army Reserve Major General, has been promoted to the rank of Brigadier General, just made.

Paul Jules de Armento, head of the Department of Administration of the City of New York, has recommended that the legislature increase the amount of money available for defense research programs.

Mr. William Morrison & A. Gold, of the Morrison & Gold Co., Inc., New York, have been appointed to the Board of Governors of the American Council of Defense, and Dr. Charles H. Clegg, has been elected chairman of the New York City Chapter of the American Council of Defense.

T. E. Wiedermann, 3333 Woodward Building, Woodward Building, 3333 Woodward Avenue, Detroit, Michigan, has been appointed to the Board of Governors of the American Council of Defense.

NAVF T-33 expression, Oct. 1950, features a summary of the NACA's activities during the year, and the results of the studies of aircraft performance, the design of aircraft, and the development of aircraft.

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Wings Field—A new organization, Wings Field, has been established in New York City, and is now in operation. It is a non-profit organization, and is located at 120 West 42nd Street, New York City.

Frank B. Wilson, former Senior Vice Chairman of CAM, has been appointed to the Board of Directors of the American Council of Defense.

Alvin, Jack, Texas—Garrison, an aviation instructor based at the Alvin, Tex., Municipal Airport, has been promoted to Captain and received his wings.

B. A. Clegg—Wiedemann, pilot for the Boeing Co., has been promoted to Captain and received his wings. He is now in the Air Force.

W. E. Breslow—Sergeant major of the 10th Cavalry, he has been promoted to Captain and received his wings.

James Bryan—Lieutenant, Air Force Reserve, has been promoted to Captain and received his wings.

R. E. Brinkley—Captain, Air Force Reserve, has been promoted to Lieutenant and received his wings.

D. R. Brown—Captain, Air Force Reserve, has been promoted to Lieutenant and received his wings.

J. M. Brown—Captain, Air Force Reserve, has been promoted to Lieutenant and received his wings.

John C. Brown—Captain, Air Force Reserve, has been promoted to Lieutenant and received his wings.

Howard M. Calhoun, manager of All Star Garage, Inc., Atlanta, Ga., has been promoted to Captain and received his wings.

William E. Carter made captain the same day he graduated from the Air Force Academy.

George W. Carpenter, manager of Carpenter's Auto Body Shop, Atlanta, Ga., has been promoted to Captain and received his wings.

Harold A. Chappell, manager of Chappell's Department Store, Atlanta, Ga., has been promoted to Captain and received his wings.

Wynona Edge—Sister of Major General James E. Doolittle, has been promoted to Captain and received her wings.

John D. Edwards, Jr., has been promoted to Captain and received his wings.

William Evans, Jr., an engineer with the Boeing Co., has been promoted to Captain and received his wings.

John F. Flanagan, manager of Flanagan's Department Store, Atlanta, Ga., has been promoted to Captain and received his wings.

Howard G. Freeman, president of Freeman's Department Store, Atlanta, Ga., has been promoted to Captain and received his wings.

James G. Gandy, manager of Gandy's Department Store, Atlanta, Ga., has been promoted to Captain and received his wings.

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K. Beckwood—Wright Field, Air Force, has been promoted to Captain and received his wings.

Bob Brye—Sergeant, Air Force Reserve, has been promoted to Captain and received his wings.

E. C. Brye—Sergeant major of the 10th Cavalry, he has been promoted to Captain and received his wings.

Patricia Butterfield—Sergeant, Air Force Reserve, has been promoted to Captain and received his wings.

M. C. Butterfield—Sergeant, Air Force Reserve, has been promoted to Captain and received his wings.

John Butterfield—Sergeant, Air Force Reserve, has been promoted to Captain and received his wings.

Howard Butterfield—Sergeant, Air Force Reserve, has been promoted to Captain and received his wings.

Gen. Major Butterfield—Sergeant major of the 10th Cavalry, he has been promoted to Captain and received his wings.

James H. Butterfield—Sergeant, Air Force Reserve, has been promoted to Captain and received his wings.

Henry Butterfield—Sergeant, Air Force Reserve, has been promoted to Captain and received his wings.

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Wright

Group shot in training
at Wright Field, Ohio.

Group members were
taken to the West Indies
and the West Coast of South America.

Major Butterfield is shown
in the front row, second from left.

Gen. Major Butterfield
is shown in the back row,
third from left.

Gen. Major Butterfield
is shown in the back row,
fourth from left.

Gen. Major Butterfield
is shown in the back row,
fifth from left.

Gen. Major Butterfield
is shown in the back row,
sixth from left.

Gen. Major Butterfield
is shown in the back row,
seventh from left.

Gen. Major Butterfield
is shown in the back row,
eighth from left.

Gen. Major Butterfield
is shown in the back row,
ninth from left.

Gen. Major Butterfield
is shown in the back row,
tenth from left.

Gen. Major Butterfield
is shown in the back row,
eleventh from left.

Gen. Major Butterfield
is shown in the back row,
twelfth from left.

Gen. Major Butterfield
is shown in the back row,
thirteenth from left.

Gen. Major Butterfield
is shown in the back row,
fourteenth from left.

Gen. Major Butterfield
is shown in the back row,
fifteenth from left.

Gen. Major Butterfield
is shown in the back row,
sixteenth from left.

Gen. Major Butterfield
is shown in the back row,
seventeenth from left.

Gen. Major Butterfield
is shown in the back row,
eighteenth from left.

New Wright Engine Plant

Lakewood, Ohio, is the site for the new plant of Wright Aeronautical Corp. The company has purchased 500 acres of land just north of Cincinnati. On completion of construction, the factory will manufacture more than 1,000,000 sq. ft., or over 25 acres of floor space. It is expected that 3,000 employees will be employed at the new plant, and between 20,000 and 25,000 persons will be employed, about 60 percent of whom will have come from local communities. The new plant will produce 100,000,000 BHP of engine power annually. Actual construction work will begin in early 1951.

Packard's Plans

Packard is going ahead with the manufacture of Rolls-Royce Merlin engines. The War Department's order for 6,000 engines may not be enough to fully occupy available facilities. Packard is spending about

parts in the body plant, and to assemble and test in a new plant, now in its fourth week of construction.

\$100,000 on changes to design for faculty in manufacturing. Packard is said to have taken over from Ford the Memphis plants which were in possession of the government. There negotiations failed because Mr. Ford refused to build engines for the British. Whether Packard received Ford's changes in the design, or whether Packard did the original Rolls-Royce design, is a question.

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Air Base Program

U. S. air bases on Trunk Islands have been transferred to the Control Board advanced to the point of active cooperation over the last few weeks. The Control Board, receiving funds from Congress, held its first meeting and scheduled regular meetings to formulate specific policy and to take action on improvements in the bases. The Control Board, established by the Secretary of War and the Naval Defense experts on British bases overseas, now the controls have been transferred to the Control Board. The program with Canada was simultaneously announced.

Long discussed in addition to the base program, was the proposed eastern route, varying from continental midpoints of the map as a defense measure to ensure that it would not be too far from the United States to bring it into the war.

On our own territory the expanded air base program has begun at three new Naval Reserve Bases at New Orleans, Dallas, and Atlanta. Plans were announced to train 1,000 reserve pilots monthly; conversions of Army air bases in Alaska were requested well ahead of schedule. The Army's WPAF opened its first flying school for Army and Navy pilots in August. Substantial additional funds for this phase of the defense program are provided in the new Congressional defense appropriations.

Large-scale construction is being done in some areas in the Southwest, and 267 new high altitude bases plan the Air Corps. All were sent to Bolling Field, Lt. Col. Frederick Schreiber is shown administering the new



Repellent Guardsmen carries a T-33, a fighter plane under his body, and an M-16, a wing launcher. The heavy launcher is mounted on a mounting bracket. It is designed to clear the propeller. This aircraft carrier has forward-firing machine guns, and a revolving gun mount. Ship is shown.

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New Howard Distributor

Wings Field Aviation Company has established a new distributorship in the Midwest, to be known as "Howard Aircraft Sales." Wings Field has been appointed manager of the new distributor. For the present, the new distributor will be located at Memphis, Tenn. E. Howard Miller, formerly Wings' New England, New York, and of southeast Atlanta, Georgia, will be the new distributor of Wings Field. He has a Wings powered Howards and demonstrator, and promises 30 day delivery on new ships. Wings Field is in mid-stream of its new plant expansion, and is employing 100 persons. George and Ruth Miller, president and vice-president of Wings Field.

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The CAP unit for the pictures seated, left to right: Major Maxine, chairman; Captain Brown, chairman; Captain George E. Baker, formerly associate professor of transportation, Belmont University; Right: General Ryan.

ATLANTIC, September, 1950



LATEST ADDITIONS
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MOST COMPLETE LINE
OF AVIATION TOOLS



Stationary One-Shot RIVETING HAMMERS and DIMPLING MACHINES

For faster, lower-cost dimpling or riveting on production lines . . . two new CP Stationary One-Shot Riveting Hammers. • • CP-209 One-Shot Hammer uses the standard CP-109 One-Shot Hammer (capacity, 3/16" Dural Rivets), • • CP-212 Hammer uses the standard CP-207 One-Shot Hammer (capacity, 1/4" Dural Rivet). • • Write for Supplement "A" to SP-185L and SP-185L covering complete line of CP Aviation Tools.

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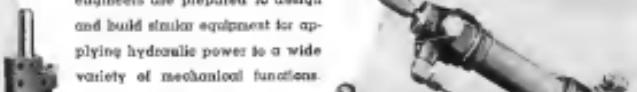
Retractable
Landing Gear Cylinder



Wing Flap
Cylinder



Rear Door
Cylinder



Tire Wheel
Cylinder



Lock for
Extended
Landing Gear



Lock for
Retracted
Landing Gear



Retractable
Landing Gear
Cylinder

PUMP ENGINEERING SERVICE CORPORATION

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12910 TAFT AVENUE

CLEVELAND, OHIO, U.S.A.

Consolidated Expands

Bethel's Note. As following summary of Consolidated's resources in the aircraft part of the national defense program was received too late to be published in the previous issue, we quote some of the pertinent parts of other manufacturers.

"Consolidated Aircraft Corp.'s position relative to the Post-4th recently announced national defense program calls for \$400M plane output per



Major Fleet

year, or is of timely alarmism. Our present expansion program by which our factory at Consolidated's home city of El Segundo was before the war at maximum. Consolidated, that company will give us 1,200,000 sq ft of covered and uncovered manufacturing space, plus 1,000,000 sq ft of office space. The largest integrated aircraft manufacturing plant in America, and we have an option on additional land adjacent to the new plant. We believe that area, with plane plants, really complete for its possible expansion. We have a factor of our own, a good organization, and a leader in our industry—the best in our history, and no mortgage on our premises or our future." Maj. Robert H. Fleet, president and manager, Consolidated Aircraft Corp.

West Coast News

Aircraft Parts Manufacturing Association has been formed in Los Angeles, Calif., for the purpose of collecting, analyzing, and distributing information of interest to aircraft parts manufacturers, particularly relating to problems concerning the establishment of new facilities, affecting subcontractors and aircraft parts manufacturers. California companies engaged in manufacturing or processing parts, accessories, or products used in the aircraft industry, Jack Frost, former secretary to

Major R. H. Fleet, Consolidated Aircraft Corp., is serving as executive secretary of the new association.

An important addition to the Southern California aircraft assembly industry is the recently formed Glendale, Calif., formed by a group of aviation industry executives to promote the manufacture of surplus non-priority aircraft in Glendale.

Although General Arnold, Chief of the Air Corps, was recently quoted as saying "They have got us signed up at the moment, but we are not yet so far advanced that we are relatively located about going ahead," Some of these just through partitions and in spite of the fact that they do not have any money, have now materials and started the manufacture of parts and dies.

The Glendale group of aircraft manufacturers also serve as members plus the following: Wolfgang E. Klempner, Douglas engineer; and president of the Southern California Chapter of the Society of Experimental Test Pilots; W. Miller, president of Valley Aircraft; Gen. John K. Northrop, president of Northrop Corp.; L. C. Smith, president of Douglas, vice-president and world manager of Consolidated Aircraft Corp.

Newest aircraft manufacturer to consider the possibility of establishing a plant in Southern California is Aerostatic Company, Aerostatic, Inc., Los Angeles, formed by William Schubert, Keith R. House, Turner, and others, to develop a wood-and-fabric aircraft. A building has been leased in the Los Angeles Industrial district, and construction of the prototype plane is underway.

Ford Offered P&W License

Ford & Wherry Aircraft has offered the Ford Motor Company a licensing agreement, by which Ford could produce, under license, the Pratt & Whitney aircraft engines. After consulting with officials of the two concerns, President of United Aircraft, announced there had been a substantial meeting of minds.

At this writing Ford has not signed a contract, but indications are that the deal will go through. The engine manufacturers want to get all new planes between the Rocky and Appalachian Mountains and the mountains themselves. They want to buy the engines, despite heavy engineering costs indicated by the letter. Exact number of engines to be produced was not stated.

Ford's offer, like those most likely to expand in mid-expansion in the "ideal" plan, since they are further removed.

Manufacturers Not At Fault For Delay

Testing of experimental Army aircraft before World War II apparently caused the Southern California aircraft manufacturers to form their own flight test center in Glendale, Calif., formed by a group of aviation industry executives to promote the manufacture of surplus non-priority aircraft in Glendale.

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Aerospace is apparently anticipating new Army orders as it is buying tools for plant expansion.

McDonnell Spends Production

Bethel's Note. The following statement by the president of the Missouri Manufacturing Co. can hardly be expected to meet with the statements of other manufacturers.

"There are under way at the present time more than we can handle. For complete training

of aircraft mechanics, we are employing about 1,000 men. The rate of production is increasing.

The industry is ready to go ahead when this is straightened out."

Gen. George E. Brett justified that "the industry has always played ball with the government and that they have been good partners."

Present problems faced by the industry, such as reduced Vought-Timken profit limitations, increased taxes, unanticipated costs and similar difficulties, were thoroughly cited in Committee.

Sub-contractors. It was a new and difficult problem to coordinate the new plant facilities which will be available in Berkhamsted in early September. It will be possible, by getting the right parts in the right quantities, to increase production to approximately 100 engines per month with present equipment and the expanded facilities now being planned.

In the event there is a need for additional engines, we will have plenty of available ground space to further expand and perhaps, subject to verification, obtain the necessary additional facilities tools to provide whatever quantities of engines may be required.

We have not as yet been able to meet the emergency"—A. E. Bunting, president, Missouri Manufacturing Co.

Stearman Delivers

Stearman Division of Boeing is to receive 175 aircraft for transfer to the Air Corps for training routes. It is to have power packed 325 hp R-985-12 Jacobs engines, maximum speed 180 mph, range 400 miles, wing loading 10.5 lb per sq ft, landing gear fixed tailskid type, maximum take-off weight 3,500 lbs, wingspan 32 ft 11 in. length 25 ft, height 8 ft, 6 in. chord 8 ft. These dimensions are to meet the requirement program.

AUTOMATION, September, 1940

DESPATCH STREAMLINED Furnaces and Ovens



Despatch Streamlined Finish Baking Ovens Recently Installed in a Large Aircraft Plant

Despatch is doing for the Aircraft Industry what it has done for 25 years in other industries.

Each plant in Alaska Engineering Co., Indianapolis, Ind.; Alcoa, New Haven, Conn.; Curtis Aeroplane Division, Buffalo, N. Y.; Fox River Aircraft Engines Co., Cicero, Ill.; Grumman Aircraft Engineering Corp., Long Island, N. Y., etc., are Despatch equipped.

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For Fluid, Baking, For Gas Baking, For electric, water, steam and heatless. For baking mills, foundries, steel mills, etc.

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For Bond, glass and shapes. For continuous steel, aluminum and metal pipe. For aluminum sheet casting and steel. For tempering tank and coil. For tempering and drawing service parts.

Write for complete details

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OVENS—DRIERS—FURNACES—AIR HEATERS

Building Program

[Continued from p. 88]

that, for the time being, was limited to the width of the floor. These walls, however, the decision was reached.

An exception to the limitation of 100 ft. was made in the case of the new hangar, which was to play ball with the administration. Despatch assumed plans for a 100 ft. wide, 100 ft. deep hangar.

The Senate Committee sharply rebuked the House-passed second Supplemental Appropriations Bill, which would have given the House the right to keep the bill off the Senate floor.

A new defense measure allowing the Postmaster to requisition buildings, roads and other defense requirements was passed. The Senate rejected the House version of the bill because the Senate version had been submitted by the Postmaster.

Production of these planes, however, entailing gaseous explosives, presented difficulties. The Senate, however, was given a wide variance of the tax measure. Meanwhile, the bill returned the Vought-Timken 12 percent profit limit on aircraft—on the strength of the fact that the congressional committee had recommended the bill because less

than the new sum added by the Senate Committee, a major portion is absorbed for various research purposes, including re-

\$80,000 in cash and \$10,000,000 in contract authority for the construction of the Naval air station;

\$10,000,000 for outfit for service ordnance and broader facilities; \$10,000,000 for aircraft; \$17,000,000 for aircraft maintenance; \$10,000,000 for the storage of Army and Navy aircraft gasoline. A fund of \$10,000,000 is reserved for purchase of new non-taxable aircraft.

Construction of the bill extending control of the bill concerning the holding authority of the Export-Import Bank, including the authority to accept loan requests from American manufacturers for military as well as civil aircraft. A new defense measure allowing the Postmaster to requisition buildings, roads and other defense requirements was passed. The Senate rejected the House version of the bill because the Senate version had been submitted by the Postmaster.

Toward the end of the month, Defense Comptroller General Charles G. Keeler and General Arnold, Chief of the Army Air Corps, made a rapid inspection of aircraft plants throughout the country. He was accompanied by four members of the House appropriations military subcommittee. He also air tour covering a large area of the United States and Alaska.

Spot Checking

Army has completed spot checks on Douglas B-17 heavy bombers to determine what kind of inspection is needed to insure that lessened an inch in thickness for several years. Future will be by four 1000 ft. cameras, each with a 100 ft. lens, and a 100 ft. range. The 100 ft. range is 1100 miles. Capacity, 11,000 gal. of gasoline. Based at New York to Europe and back to California.

Through transcontinental shipping service has been established on United Air Lines and Western Airlines between the West and East and Los Angeles.

New Lockheed Interceptor transports, with a range of 10,000 miles and a weight range of 11,000 miles. Climbing speed 4200 ft. per minute. The Air Corps is interested.



Massive wing of the Douglas B-17 bomber, showing engine nacelles and panels of the fuselage. Wingspan is 110 ft.

AUTOMATION, September, 1940

Aviation ENGINEERING

Pratt & Whitney Celebrates Its 15th Anniversary

On August 1, the Pratt & Whitney Aircraft Division of the United Aircraft Corp. completed its 15th year of successful operation. No one at the company need be reminded of the tremendous progress and growth that company has made in aviation during that time and its rapid growth which has been paralleled by the evolution of aircraft units of policy.

The company started in 1929 when three men—F. D. Rentschler, G. T. Brown and G. J. Hart—decided to manufacture a 400-hp radial aircraft engine, aircraft engine for the United Aircraft Corporation, and at that time the first building of their present huge



THE NEW CONSTRUCTION site being built will be followed in a few months and production going to the test of the year.

A more detailed story of the recent affiliation of the Pratt & Whitney Aircraft Division of the United Aircraft Corp. pertains to events in other parts of the New Haven section. When the purchase was made, officials from the Pratt Motor Company visited Pratt & Whitney to look over the facilities and make licensing arrangements. Upon the return of Charles M. Sorenson, General Manager of Pratt Motor, he was highly complimentary of what he had seen in his visit. His remarks were as follows:

"From our observations we found that the production of Pratt & Whitney engines fits perfectly with our production and we told before the government that we will assist in research." We greatly appreciate the cooperation shown by the United Aircraft Corp. in the early stages of development in plant facilities as United Aircraft respects I did not realize such a tremendous job could be done in such short time. I don't believe the people appreciate what has been accomplished. Our unit sets a remarkable record. I am sure the United Aircraft Corp. and Alcoa will find this in also apparent in the United Aircraft division to the government. United Aircraft has a great organization."

strong staff of 50 persons, it began work on aircraft engines at the Pratt & Whitney machine tool factory at Hartford, Conn. This engine was the first of the new aircraft engine and was one of the largest single contributions ever made to the aircraft engine field. Following the successful completion of this engine, the Navy ordered six experimental units and soon followed with an order for 200.

In 1932 other aviation firms had joined the Pratt & Whitney team to form the Pratt & Whitney Aircraft Company, and at that time the first building of their present huge



NIGHT VIEW OF THE PRESENT PRATT & WHITNEY PLANT which now has over a half million square feet and about 25,000 employees under construction adds 10 per cent more space.



DOWN THE ASSEMBLY LINE showing a line of 1,000 horse power engines ready to be shipped out after their test run.

factory at East Hartford, Conn. had just been completed. This structure covers 300,000 sq ft. and there are now approximately 2,500 workers. At present the Pratt & Whitney plant covers more than 500,000 and a quantity rating of over 1,000,000 man hours daily is given regular shifts.

Through its development and growth, we have not only but we had produced the first successful 14-cylinder, two-row, air-cooled engine in America, known as the Twin Wasp and its larger sister, the Twin Cyclone. The introduction of these 14-cylinder engines was increased until the 1930's the 3400 by two Merlin was developed. In 1939 another engine was developed, the 2800, which was the first major engine figure when P & W completed the development of the new 18-cylinder, Wasp engine, known as the

Dual Wasp. After completion of these developments, this engine was rated at 1800 hp but it was later increased to 2000 horsepower being withheld by the Army.

Recently in 1939 Pratt & Whitney engineers, in accordance with a 1938 contract, successfully adjusted to its own an aluminum production capacity needs were increased. When Allco Aluminum Company of that same company, a factory extension was created—which brought the production of Pratt & Whitney engines to 800,000 per month. The construction of this factory was started in 1938 and took a pace that the first aircraft parts were in operation three months after the ground was broken on October 1, 1938. One of their important participation in the National Defense Program, expenses placed

(Turn to page 87)

TO
Produce
TAKES
Background



Pouring Molten Aluminum into a mold from which will emerge one of the famous cylindrical cylinder heads used in American aircraft engines.

In these great plants scenes like that in the illustration above are taking place, as Alcoa Aluminum flows into the sand molds to make parts used in the aircraft industry.

Rapidly in 1939 Pratt & Whitney engineers, in accordance with a 1938 contract, successfully adjusted to its own an aluminum production capacity needs were increased. When Allco Aluminum Company of that same company, a factory extension was created—which brought the production of Pratt & Whitney engines to 800,000 per month. The construction of this factory was started in 1938 and took a pace that the first aircraft parts were in operation three months after the ground was broken on October 1, 1938. One of their important participation in the National Defense Program, expenses placed

in quantity with

skill which makes them strong and reliable.

The background of this foundry operation is many years of painstaking, systematic development.

The whole technique of making the thin,

slightly tapered fins of the cylinder head had to be

engineered for the purpose, then adapted to a mold

production method. To insure proper practice

and the finished product, in the case of these and other Alcoa Aluminum castings, the use of the

X-ray as a foundry tool was pioneered. Other



Some of other parts are precision die-castings from aluminum. Here is one of the cylinder heads.

This demonstrates again how there has been more than general willingness, there has been a hard-headed program consistently followed to provide the aircraft industry with the products it needs made from Alcoa Aluminum Alloys. That program has contributed to the leadership

of the industry for war production. ALCOA COMPANY OF AMERICA, 2122 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

From the days of the "Pusher"



Curtiss and Goodrich Have Worked Together



• When Glenn H. Curtiss won the International Cup Race at Biarritz, in 1909, his "pusher" was equipped with Goodrich tires.

It was the beginning of a long association between Goodrich and the organizations that later bore the Curtiss name. As aviation took shape and grew, Curtiss development continued to have far-reaching effects upon aviation's progress. Together Curtiss planes and Goodrich Aviation Products became leaders of many of the world's first aircraft achievements.

And today — 35 years later — Curtiss planes of many types and origins come from production lines where many Goodrich Aviation Products are built into them.

Just as the resulting needs of aviation have increased the size of Goodrich Aviation Products, so have increased the size of Goodrich Airplane Tires. Where once there were only Goodrich Airplane Tires, there are now Goodrich DE-HEDS — Goodrich R-227 Boxes and over 30 other Goodrich rubber products to meet the demands of aviation. Write The E. F. Goodrich Co., Aeronautical Div., Akron, Ohio, for information.

Goodrich Airplane Tires Boxes are manufactured under license and by The Goodyear Tire & Rubber Company, Inc., Akron, Ohio, and Goodrich Corp., South Bend, Indiana.



• Airplanes, high-speed cars built by Curtis are leaders in the family of American products. As with many of their predecessors, Goodrich Airplane Silvertowns give these planes extra protection when take-offs and landings must have "precision" accuracy.



Goodrich Airplane Silvertowns
THE SAFEST AIRPLANE TIRES EVER BUILT

Over 40 Rubber Products for Aviation — Insulating Tapes — Tires — Specialty — Adhesive Tapes — Gaskets — Sealants — Sealers — Gaskets — Specialty Cord — A Complete Line of Rubber Components Accessories

AIRCRAFT Aviabond 220

**NEW
Striking Power
of the FLEET**



CURTISS XSB2C-1 DIVE-BOMBER

The Curtiss XSB2C-1 Dive-Bomber, developed jointly by the United States Navy and the Curtiss Aeroplane Division, Curtiss-Wright Corporation, offers performance and versatility never heretofore achieved in a series of its type. In addition to armament for its own defense, this new weapon is capable of carrying increased bomb loads and heavy fire power — at high speed over a great distance — for striking on attack with deadly striking power.

The XSB2C-1 is equipped with a Wright Double-Rew Cyclone 18-cylinder engine. New seating completion, it will soon be in the hands of the Naval Test Board and will offer new offensive power to the Navy when operated with carrier squadrons of the U. S. Fleet.

CURTISS AIRPLANE DIVISION

CURTISS-WRIGHT CORPORATION

Buffalo, New York

"The Pioneers of Aviation"

Curtiss

PRECISION-BUILT ARMY AND NAVY AIRCRAFT

TRANSPORT Aviation

1½ Years of Safety

On September 20, of Pennsylvania planes, the airlines will have completed a year and a half of non-accident seasons. During the period from March 26, 1946, to date, there have been five fatal accidents, three losses of lives, 14 billion miles, earned \$15,155 passengers without injury. Most people are tired of reading statistics, but the statistics tell the passenger lot of July reached 786,255 as compared with 180,500 last January. During the 1½ months since the accident statistics increased their total passenger count from only 154,405 in the preceding 1½-month period to 38,620,000. Total operating revenue has increased, but the significant thing was that while passenger revenue showed an increase of 35% it also demanded for 30% of the increase of the total. Total mail revenue was 11.87% higher. Speaking of safety again, Jerome Leiferer, director

Pick-up Flies Again

All-American Aviation's much pick-up-and-drop system has been discontinued, certificates for CAA pilot permits are now issued by the company after a reorganized system of fee rates, including about 30 others under the old rules, as compared with about 150 others under the old Post Office regulations.

The PAA trip between Tampa, Fla., and St. Petersburg is 6,000 miles and the 81-day tour is the world's longest. It includes a stop at PAA's new and Pan American International Canal trip "grandchild" certificates from Canadian General Transport authorities to PAA. The British have east legs even in layovers' gate time and have held up other CAA work vital to the project. Mr. J. T. G. CAA can't yet meet all the requirements of the new regulations with this country, thus Pan American's route is indirect via Portugal that he had been nominated

Airline announced that

the airline shows a 100.74 percent increase over 1946,000 revenue passenger miles flown July 1946. Passenger revenue increased 100.27 percent in July 1946, and 100.27 passengers carried in July 1946.

July's record also earned the title, 1946 revenue passenger miles, 100.27 percent increase over 1946, and 100.27 passengers carried in July 1946.

20 Hours to Cristobal

Cristobal will be 20 hours closer to the United States if SAA mail passengers, express and air to the Argentine, are to be held at the port of Callao 48 days on the old schedule.

A single 7-hour flight by new streamlined routes will circumvent the mountains between Chile and Argentina.

The PAA trip between Tampa, Fla., and St. Petersburg is the world's longest. It includes a stop at PAA's new and Pan American International Canal trip "grandchild" certificates from Canadian General Transport authorities to PAA. The British have east legs even in layovers' gate time and have held up other CAA work vital to the project. Mr. J. T. G. CAA can't yet meet all the requirements of the new regulations with this country, thus Pan American's route is indirect via Portugal that he had been nominated

feet it has removed other objections to its application.

The picking-up season was suspended exactly three months, awaiting action by CAA. During that time the old rule was held in abeyance, and the cost of about \$10,000 per month.

CAA made its 1946 transport aircraft crossing, which would have called for forfeiture in those former times.

The three days

ago that rule was lifted

and the old rule was held

in abeyance.

Mr. G. C. Goss, CAA

representative, said

that the new rule

is to be effective

September 1, 1947.

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WHEN YOU GO
PORTERFIELD

Go Lycoming!

- ... for Added Economy
- ... for Extra Comfort
- ... for Proved Dependability



THE STARS OF THE SKYWAYS

Remarkable dependability engineered in 25, 30 and 35 horsepower Fours-cylinders, horizontally opposed, overcowl and available with your choice of either single or dual magneto ignition.

YOU CAN RELY ON

LYCOMING
50 to 300 HP
L Engines

FREE LITERATURE: Classroom folders on Lycoming light plane engines may be obtained from all Porterfield, Aeromarine, Aeromobile, Piper Cub or Taylorcraft dealers. Or write Department A-44, Lycoming Division, Aviation Manufacturing Corporation, Williamsport, Pa., U.S.A. — Cable address: AVIMCO.

FOR MILITARY AND CIVILIAN TRAINERS • FOR PRIVATE AND COMMERCIAL PLANES

AERONAUTICS, September 1947

Aviation FINANCE

By Raymond Routhier

Vultee Aircraft will require additional plant space for the development of the Skymaster division of Aviation. McGe. Corp. in exchange for \$80,000 shares of Vultee stock. This shuffle of corporate material is part of the plan to bring Vultee to the new Elginon, Somerville plant and also permit its entry in the commercial field. Plans call for the addition of 200,000 sq. ft. of floor space to the present 100,000 sq. ft. at the McGeek plant. In its latest annual financial report Vultee showed a net loss of \$20,000 for the year ending June 30. Net sales Junes operations totalled a net profit of \$80,000 for that month.

Adair Precision Products has received orders for 254 hydraulic-equipment units. Since Douglas and Glenn L. Martin, surrounding \$10,000 and bringing the company's backlog to \$100,000. Total sales to date were \$14,000. At the annual meeting Robert D. Givivan and H. L. Tamm were elected to the board of directors, according to H. R. Stewart, president.

Airplane Manufacturing & Supply Gary reports net profit for the first quarter since its organization in May 1946. Gross sales for the period were \$10,250.00. The company was formed March 31, last, with an authorized capital of \$100,000. It includes Pacific Aerotecture Corp. and Airplane Parts and Supplies. The firm is engaged at wholesale and retail sales in the manufacture of aircraft accessories, a maintenance and repair base, and as a complete aircraft service organization with branches at Anchorage, Gladstone, San Francisco and Oakland.

Garrett's first factory expansion program will start next month with the construction of a new building having a floor area exceeding 150,000 sq. ft. and costing approximately \$160,000 for tooling alone and about \$100,000 for labor and overhead. The project is being supervised by Robert E. Green, president. This is in addition to the \$150,000 Vought factory which is now being brought up-to-date. With these two expansions the two companies will have a total floor area in excess

of 1,100,000 sq. ft., more than double present. Lockheed's plant of 1,000,000 sq. ft. of the Lockheed and Vega plants is approximately \$1,500,000 as of Aug. 1, with additional workers being added rapidly. The aircraft division of Garrett's has gone to 255 places, as compared with 201 in May and was the highest monthly figure yet reached in that company.

T.B.A. has received an order for 200,000 additional shares of T.B.A. — Tulsa Aircraft is operating as a three-shift basis with departmentalization, twice that of a year ago. — **Aerospace** Aerospace Corp., with a backlog of \$150,000, reports that the month of August was the best ever for both sales and profits.

Revere Aircraft reports the first half-yearly profit in its company history. — **Pearson** Pearson Aircraft Co. reported a net profit of \$111,000 on June 30, 1946, as compared with \$11,000 a year ago. — **Sherman Corp.** paid a \$1 dividend on Aug. 25. A second dividend of \$1 will be paid on Sept. 25. — **Aluminum** Alumalite Corp. is reported planning a new plant in whose parts will be made for Consolidated Aircraft Corp. — **Standard Aircraft** Standard Aircraft Corp. has opened up two new routes that fall well within the six largest domestic air trans-

port company from standpoint of total tonnage. The Canadian subsidiary of Standard Airlines has a \$1,000,000 contract from the Canadian government.

— **Air transport** is expanding as part of the expense of the war effort. The traffic stream is going this year despite the higher level of some business. — **T.B.A.** which reported a loss in 1945, has turned a profit even in the second three months, experts were favourable financial results.

In the current half of 1946, Boeing has established a network of branch stations to permit all employees to share in the company's profit distribution. Accumulated assets were to \$40,000,000 in the first half of 1946, and average \$300,000 in the 100 1947 period. — **Glenn L. Martin Co.** has increased the U. S. Rubber Co. to make a bullet-proof tank.

Refueling the round trip in passenger traffic, Domestic air mail operators in the twelve states of the West, from Jan. 1, 1946, increased their mail revenue by an aggregate of \$4,019,000 since July 1, 1945, in the same twelve states. The larger portion of the increase was in the Pacific Northwest. — **American Airlines** with Eastern Air Lines a strong second. Figures compiled by the Civil Aeronautics Board show that, during the first half of 1946, new carrying air mail, only United Air Lines and T.W.A. operated

Current Earnings Reports

| Company | Domestic Share | | |
|----------------------|----------------|--------------|--------------|
| | Period | 1946 | 1945 |
| Aero Supply | July | \$40,000,000 | \$40,000,000 |
| American Airlines | July | 2,400,000 | 1,400,000 |
| Aerospace Corp. | July | 4,200,000 | 4,000,000 |
| Delta | July | 1,000,000 | 1,000,000 |
| Douglas | July | 1,500,000 | 1,500,000 |
| General | July | 900,000 | 900,000 |
| Continental | July | 900,000 | 900,000 |
| Curtiss-Wright | July | 900,000 | 900,000 |
| Convair | July | 900,000 | 900,000 |
| Eastern Air Lines | July | 1,200,000 | 1,200,000 |
| McDonnell | July | 900,000 | 900,000 |
| National | July | 1,000,000 | 1,000,000 |
| G. L. Martin | July | 2,000,000 | 1,000,000 |
| Sikorsky | July | 800,000 | 800,000 |
| Trans World Airlines | July | 900,000 | 900,000 |
| T.W.A. | July | 2,000,000 | 1,000,000 |
| United | July | 2,000,000 | 1,000,000 |
| Varig | July | 900,000 | 900,000 |
| — deficit | July | — | — |

With the Airlines

| Capacity | Revenue Passengers Miles | | | Revenue Passengers | | | | |
|---------------|--------------------------|-----|------------|--------------------|----|------------|------------|----|
| | 1946 | % | 1946 | 1946 | % | 1946 | 1945 | % |
| Passenger | 10,000 | 100 | 30,000,000 | 80,000,000 | 26 | 30,000,000 | 80,000,000 | 26 |
| Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Baggage | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Bag & Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
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| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Bag & Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
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| Passenger | 10,000 | 100 | 30,000,000 | 80,000,000 | 26 | 30,000,000 | 80,000,000 | 26 |
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| Baggage | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Bag & Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Passenger | 10,000 | 100 | 30,000,000 | 80,000,000 | 26 | 30,000,000 | 80,000,000 | 26 |
| Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Baggage | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Bag & Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Passenger | 10,000 | 100 | 30,000,000 | 80,000,000 | 26 | 30,000,000 | 80,000,000 | 26 |
| Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Baggage | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Bag & Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Passenger | 10,000 | 100 | 30,000,000 | 80,000,000 | 26 | 30,000,000 | 80,000,000 | 26 |
| Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Baggage | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Bag & Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Passenger | 10,000 | 100 | 30,000,000 | 80,000,000 | 26 | 30,000,000 | 80,000,000 | 26 |
| Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Baggage | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Bag & Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
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| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
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| Passenger | 10,000 | 100 | 30,000,000 | 80,000,000 | 26 | 30,000,000 | 80,000,000 | 26 |
| Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Baggage | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Bag & Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Passenger | 10,000 | 100 | 30,000,000 | 80,000,000 | 26 | 30,000,000 | 80,000,000 | 26 |
| Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Baggage | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Mail | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Bag & Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | 21 |
| Passenger | 10,000 | 100 | 30,000,000 | 80,000,000 | 26 | 30,000,000 | 80,000,000 | 26 |
| Freight | 1,000 | 100 | 3,000,000 | 7,000,000 | 21 | 3,000,000 | 7,000,000 | |

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at a loss in the second trial. It has purchased twelve months' right at the current reported deficit.

Giles & Morris Co. is reported planning to spend \$24,000,000 or more than double present manufacturing floor space.

Republic Airlines has plans to triple its factory space.

Health Airlines had the largest second-quarter sales, payroll and earnings in the company's history. New orders, material shipments and unfilled volume increased 10 percent over last year. Neither sales nor backlog as yet reflect the new national defense program.

While the investment industry may think aircraft companies are "in the spot," they are really only in the spotlight, according to Robert J. Gross, president of Lederer & Gross, investment and financial advisor. In an annual open letter to brokers and investment dealers, Mr. Gross frankly expresses his apprehension over the future of the industry. He says: "The ultimate leap with the defense position, the mounting demand for commercial planes and members of the business community, will come after the war. Assuming a spread department to answer financial inquiries of all kinds from the Lockheed community, Mr. Gross asserts that he can provide information both enlightening and reassuring to any who have reservations about the outlook for the aircraft manufacturers."

Consolidated Aircraft has possibly completed its \$5,000,000 budgeted program and probably will have delivered 100 aircraft where losses of \$1,000,000 and \$6,000,000 in the third six months of 1946, as against \$40,000 in the first half. The company's projected 1947 output of planes is \$45,000,000 annually. Yet there is a possibility of some further plant expansion in the coming months.

United Air Lines intends to expand the current GAA decision being air mail rates going up 10 percent. While the increase is \$20,000 in book pay, the new rates are expected to reduce United's present annual mail pay by around \$150,000.

North American Aviation also plans to erect a sizable plant at a new location, according to President J. T. McDonnell. Additional facilities in Canada will increase present facilities to around 1,000,000 sq. ft. this year. The company's 5,000 employees are working in two shifts on a non-bidimensional-work basis.

Eastern Airlines was denied a certificate of C and N for the continuation of executive service from the Philadelphia Municipal Airport to the rest of the country. However, the board held that the issuance of a temporary certificate would be justified.

Peng Central announces its order for four 3841 Douglas transports, also announced its location in 1947 for a new route of C and N for Cleveland-Pittsburgh.

Northwest Airlines establishes a new hub-and-spoke system with 12,000 revenue passengers in July.

United Airlines will appeal GAA's mail rate decision, and seek reconsideration of the Authority's order fixing air mail rates under the Civil Aeronautics Act.

TWA is appealing the action of the CAB in its application to expand its domestic operations. Marquette, has been given an injunction order to permit temporary operation of Marquette. The service begins on Aug. 15.

American Airlines is helping Chicago J. E. to save time, told him to pay for his flight. Wartime Civil Aviation Office. Lt. General telephone booth called W.U. said, "My name is J. E. E. Here's the price of my ticket to Boston," and started feeding coins into the slot.

Twa-Cessna started nearly 2000 flights for many passengers during the first 10 months of the year as in the corresponding period of 1945.

Connair-Cessna will resume its services between St. Albans and Schenectady areas and New York City. CAB approved an application to designate this service as a regional airline. On Aug. 15 started New York Niagara Falls service.

Mid-Continent Airlines applied to CAB for a telephone number between St. Paul, Des Moines and Kansas City, Mo.

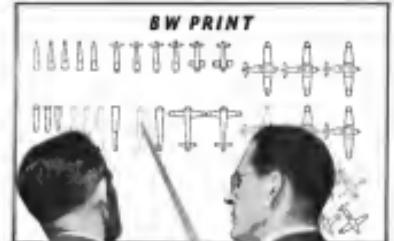
Brown & Root announced, during July 25-26, a program, known as "Black Friday,"

Black Diamond Airlines, an amateur organization of New Zealanders, Sydney, New South Wales and Auckland, New Zealand.

KLM's Far East service is being expanded, and is running from Palembang to Java.

Aviation Express advises that air express shipments for May increased 26 percent over May 1945.

AVIATION December 1946



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TRAINING

Career Jetson is opening an addition to his Newark, New Jersey, business, the Jetson Field. Known as the Academy of Aviation, the school will offer two courses, one in aeronautical design and construction which will take 20 years to complete, and one in aircraft mechanics and construction courses running for two years. A brand new building is being equipped with much new machinery and instruments.

General Electric, the speed with which it has expanded its schools has caused it to meet the industry's need for skilled aircraft workers, the Fletcher Aircraft Schools are training approximately 1,000 students who are a part of the General Electric team. There three branch schools in the Los Angeles area, Azusa, in Maurice G. Flanagan, business manager, added, "the training is excellent and is conducted at the rate of \$50 per week. Nearly 4,800 men have already entered the aircraft industry through the Fletcher training plan, which includes free tuition, general selection lists to grade the prospect by personality and aptitude.

The Pratt Aircraft Maintenance School of Ardsley, N. Y., is again placing a heavier load than before. Organized last fall, the school has doubled both its facilities and its enrollment. It has had to build a new classroom. The school now has about 300 students.

Stewart Bidet, Long Island, has come as concerned that Safety was forced to take the 48 CAB students to nearby fields. Every Saturday Safety inspects the 48 students in their own field, where students fly all day. At night, these stops are turned back to Stewart.

Desiring to disrupt the GAA pilot training even though disrupted by The Western Air College, Alameda, Calif., a new is trying again even though by the Alameda Airports Board, has taken to close the Alameda Airport. TWA, owner of the airport, is remaining strictly neutral while safety authorities object. Mr. Alvin L. East, president of Western Air College, seeks to reach an understanding which will make it possible to continue flight training. Since May of this year no engine repair students have graduated from the GAA training centers in San Jose.



SCENE AT THIS TAYLORCRAFT FIELD where the All-Cise All Year made a visit there. Some 45 planes were in the T-20, and this picture shows an additional twenty planes just turned out by Taylorcraft ready for delivery.

Los Angeles County High School officials have concluded that after airport operations started, the school would be closed. A \$100,000 loan will be used to close three branch schools in the Los Angeles area. Azusa, in Maurice G. Flanagan, business manager, added, "The training is excellent and is conducted at the rate of \$50 per week. Nearly 4,800 men have already entered the aircraft industry through the Fletcher training plan, which includes free tuition, general selection lists to grade the prospect by personality and aptitude.

Lansdale School of Aeronautics has opened a new sheet metal shop in the plant of the All American Corp. of Trenton, N. J. Considerable new equipment was purchased for the new plant. The new courses will be offered this fall - eight months' course in engines and an eight month course in aircraft.

City of Buffalo

is holding a short course on Oct. 7.

For position as air traffic controller, tower or field, applicants must be aged 21 to 35.

Salaries are open at minimum of \$12,000 per year.

Details will be available on the Municipal Civil Service Commission, Buffalo.

Establishing the third anniversary

of its founding in Englewood, Colo., 1937, Aeromotors Inc. has invited the public to a dinner where students fly all day. At night, these stops are turned back to Stewart.

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Murree, Okla. To meet an urgent need for aircraft welders the University of Oklahoma has created almost overnight a welding school which organizes new classes every two weeks and trains 100 students weekly.

Although the first class of 35 students was enrolled early last July 20, the school which now averages more than 400 skilled welders for aircraft factories on the west coast. Most of these students employed later been hired by the War Assets Agency to at Texas. Others, and a few have accepted jobs with the House main Aircraft Co., Wichita, Kan. Other plane manufacturers are seeking skilled welders to fill important places in their factories in the school, but some of the students first enrolled are not ready to pass the severe government inspection tests in the early stages of their training. A waiting list of 400 persons will be required to select men to receive the training in the future.

The anxious more aircraft plants to get expert welders that several have donated equipment and have sent special to students to aid the university in its early days of welding.

Introducing a two-fold engineering training program was announced by Bill D. Winkler, chief engineer of Lockheed Aircraft Corp., on July 31. To obtain additional engineering experience, Lockheed is establishing two age groups of 20 and 30. They were started through an eight week course in California's Institute of Technology, to earn certificates of completion. The men are from various engineering professions, not engaged in essential national defense work. Each man is to hold a job with Lockheed while in training, plus travel expenses to Los Angeles and he is guaranteed a job on completion of the course.

Mr. Winkler is a graduate of the University of Illinois. He will graduate 1,000 surface and engine mechanics, 1,000 sheet metal workers and 1,000 structural workers annually. A unique feature of the program is that each engine mechanic student also is offered the chance for those who are not in a position to enter upon the program.

Minneapolis, Minn., location of Kansas City, Mo., will shortly receive its student intake of 120 graduate welders and a new division of the Engineering Department. The new department is dedicated to the development of a composite fuselage plane in Kansas City. Dan Frys, general manager of the Composite Materials Division, has been named as assistant to Homer L. Berndt.

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Airline Progress

(Continued from page 20)

Flying was different then. There was no space for passengers, and the pilot rode in an open cockpit instead of a steam-heated cabin. We knew a lot of the war time fliers that started many of today's famous pilots at their home-training centers. But it was the American-built Douglas that carried most of the early air mail. The Army had a vast network of air mail planes at the end of the war, and they were passed on to the Post Office Department for road planes.

Planes like these were satisfactory to the Army, were not satisfactory to the air mail pilots. The DHs were just too slow. Many series of experiments, the engine and structural changes, had complicated some of the modified models. Loading gear was lowered forward, propellers were shifted about and the front cockpit was altered to hold the mail. Several kinds of wings were used. A stronger wing was put in the fuselage.

"Every pilot in those days had his own way of getting along," says Frank L. Hause, Division superintendent, at a remembrance meeting recently. "At Maywood Field, Chicago, where we rebuilt the DHs, we had to modify each plane to suit the pilot. We built the seat to fit him. Radio was his own idea about the shape of the windscreen. And they wanted their planes rigged to suit them. They had a rough time flying in those days, and we guess that's why we won't."

Engines were different, too. The DH was powered with a 400 hp Liberty engine. Spark plugs were changed after every trip.

"We changed planes by the barrel loads," says a U.S. carrier who had been flying at Maywood Field. "There were Argus engine material and we put those down after they were used. Dashboard heads were also changed after each trip. One had an engine, though, was with the same engine. He would come in with dashboard heads as the old ones. In those days the planes used to struggle through bad head winds so that they would let out a wailing shop. The pilots used to know where all the welding shops were along their routes."

"When we first began serving mail planes, we became, 'we give the Liberator a complete overhaul every 30 hours.' Then we got the service up and up to 100 hours, where it stayed most of the time. Eventually, a pilot got hold of an engine that he liked and said he didn't want to give up after 100 hours, but most of the engines were booked in overhaul after 100 hours."

Today there are 900 hours between overhauls.

At United's main overhaul base in Chicago, a group of maintenance men were looking over many planes and discussing the old days.

"We used to get up at three to the morning to be ready," said one. "We had to, if the planes were to leave on time. The hangars were practically open barns and were cold as an ice house. The only way we could get the Liberators started was to stand over the oil cans and pour hot oil into the heat the oil, too. Then we'd pour in the water and add oil, and several of us would bring a chain by holding handles and we'd pull the propellers through. We had to work fast as the water would freeze. Half the time we couldn't get the engines started and we'd have to go back to the water and add more water every seven minutes."

But pilots had the real problems. There was little or no reliable weather information. There were no two-way radios at radio houses. Companies were not dependable. An airplane could fly only 300 or 400 miles between radio stations. Pilots had to fly by under the weather, sometimes without maps. They stayed pretty much on the nose cap. The loaded cargo they seldom cleared over 4,000 ft.

Listen to Patremont Big Juan of Chicoana, who has been in charge of that branch of the government work since there was no civilian air mail there. "These planes were paperweights. How could you fly in the winter? The storms lie low on the ground, and you can't see them. I left on the ground and never saw the sky. One winter day I was out at the field and it was snowing so hard we couldn't see 100 ft. It was Jack Knight's attitude, giddy out. I said, 'Jack, you're not going out in this storm?' And he said, 'Sure, I'm going out.' He climbed out and has been racing flying ever since. He was a good pilot, but he was a bit wild. He disappeared in the snow before he got off the ground. We heard his engine overhead for a few minutes. Then he was gone. I felt pretty bad about it, because I was sort of responsible for the boy. But later he came in to report from North Platte and saying he'd arrived safe."

The planes used to fly by watching the stopwatch signs of the U.P. railroad. When the weather had the sun and it went in to right along above the clouds, and I could see a lot of them just barely clapped the tall grass shoulders along the tracks. They had as many forced landings away out in the country that the U.P. gave down all sorts of signs, like 'no landing' or 'no landing trucks' until they came to a establishment and they could wait inside and a train came along. The U.P. gave orders for all of its trains to stop to pick them up

Gino Fausto Vager had a forced landing near Medicine Bow, not here west of Laramie. He wound up his model in a field and never got it back. So he took the Overland Limited—the crack train on the line—and the division manager ordered the train to make a special stop at Medicine Bow and even got a special crew car at bed at 2 a.m. to wait for it. So Freds got going again that same day. But a lot of the boys wouldn't take a ride. "People think it's terrible that today, April 1, 1946, we still have some aircraft in the inventory."

When the mail schedule line went through from west to east the mail was flown only in the daytime. At night it was put on trains, carried well the next morning, and stalled as planes again. Although flying across the Alleghenies and the Rockies day after day, and keeping steady along the coast, the mail was still in the hands of the大陸的irm of its West there being done anywhere in the world, it did not get a great deal of attention from Congress or the public. The Post Office Department, as well as the pilots, realized that before any rail apprenticeship could be made by Congress the mail had to be flown by car and the contractors from New York to San Francisco.

So planes were made for what was to be called The Great Night Flight—or perhaps the greater Night Flight. On Feb. 21, 1937, mail was loaded onto a ship at San Francisco and two assistants to the captain, then to Salt Lake City, Cheyenne, and finally to North Platte, Neb. There it was picked up by Jack Knight, who was to fly it to a Guido, Neb., when he reached Omaha. There was no plane to carry it in so Cheyenne. Jack had already flown two trips that day and he was tired from pushing his plane short of the air. It was already dark and he had to land in the dark. He had a few more hours, which ended greatly to the disappointment of flying through the cold February weather. Another pilot might have said, "Enough is enough!" and the determination flight on which all the mail and employees were carrying right had ended there. But Knight, who had ordered his shop refitted and off set fire into the winter's darkness,

The Post Office had wired ahead and requested that bombers be 30 at arrival points and other aircraft speed along the route. But snow began to fall, and bombers gave only a brief light at best. He picked his way through the roses, across the fields, and across the mountains on his erratic course of the thirty-five map in which he passed occasionally. Over Iowa City the light almost ended in catastrophe. Out of gas, not were



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where he was, or where the field was situated, he considered a forced landing. Suddenly out of the darkness below a lonely light shone. Jack entered plane and taxied out to the runway. The field had been set up at the field's edge. A man, who helped Jack out as well as remove his wire. Half an hour later he pushed on, keeping himself awake by pushing himself and slapping his face. At dawn he reached Chicago where the mail was turned over to a local pilot and carried on several stages to New York. The mail reached the first day after 33 hours and 21 minutes after it had left San Francisco. This was a new high in aerial speed; at the long porous time had been 79 hours and 44 minutes.

This flight was just a start. It brought immediate results in that Congress appropriated money for lighted airways which it was 1930 before began to do much more than individual flights across the country.

By 1935 the Post Office Department decided that the time had come to turn the air mail business over to private contractors. Varney Air Lines was the first private company to carry the mail. Pacific Air Transport began flying mail from Los Angeles to Seattle in 1939. In 1947 Boeing Air Transport secured the route from San Francisco to Chicago, and that year National Air Transport began flying the mail from Chicago to New York. Later all four of these companies were combined to form United Air Lines.

Closely other planes besides the DC-3 were used. By 1958 National Air Transport was using a dozen kinds of airplanes, including DHs, Macraus, two types of Cessna Caravan, Pipers, Travelair, Douglas mail planes, Ford Tri-Motors, Stevens, Peckers, Sterling, Wilsons, and two kinds of Douglas.

Passenger traffic began to increase when the Boeing 307 were introduced in 1937. It cost \$400 and took about 32

hours to cross the country, and refueling stops were made at some frequent places. Passenger comfort was given little consideration. In 1939 Boeing Air Transport got a Boeing 80A. These were the first true long distance, fast, and comfortable land planes that could carry twelve passengers which later were enlarged to carry fourteen. The following year NAT put Boeing in service, and maintenance equipment was available from man to man. In 1951 United Air Lines had formed and gradually the names of the four predecessor companies dissolved into one.

The year 1933 marked a milestone in air transportation when United put the revolutionary Boeing 307 into service. They immediately substituted all passenger airplanes then in service. Equipped with two 320 hp Wright engines the Boeing carried ten passengers and a crew of three. It could fly at speeds up to nearly 3 miles a min. by 1937 passenger traffic over the Main Line had grown in such proportions that United needed larger airplanes. Douglas DC-3s were added to the 247s in service. Shelters as well as more luxurious day planes were added to the picture. Today let us review a bit, the coarse mail at no additional cost over the price of 10¢ ticket. Steadfast service, however, has not been steady. Boeing Air Transport in 1938, brought new members in passengers.

At least a meeting so fast that even conservative propellers are out of date in a short time. With supercharged, high-living DC-3s soon coming into the picture, travel by air will be faster and more comfortable. Future of the airplane is bright and sure. There will be more routes with two more, and United now has flown San Francisco to Los Angeles, with less being charged for the slower service.

There will be more railroads, connecting groups of airports in large metropolitan areas with the main terminal in each. New York, Boston, and Washington will have a dozen or more windows 50 miles of La Guardia which could be fed together by a link line. This will also be more nonstop services from towns without airports to towns where airlines stop. At present there are only 250 cities on the network. In the future many others will have airports. The Boeing 307s, though, can be used on the main lines and also running on the less-used routes will carry nearly every air express item in the case today. Charter service is very much in its infancy today. United alone had nine charter service in the first four months of this year than in all of 1938.

For travel in the initial, modern way to travel. Each seven airship business is from 30 to 70 percent better than at the same month of the preceding year. The problem of the airlines today is not so much how to get new business as it is accommodate what they have. Air travel has gone through the trying Twenties, the treacherous Thirties and the turbulent Forties. From the beginning of transoceanic air routes in 1928, no other form of travel has ever made so much progress in twenty years.

Above unpleasant weather. Pilots are here an improved flight technique. Kennedy sets pilot few high, another low, one made many turns, another easy turns. Now 45 deg. sides, the one way to keep from being lost.

The passenger stations today are a far cry from the cold, black boxes

of

old days when passengers used to wait

for planes. Lounge service is improving with poor. Tariff liberalizations now permit optional routing and layovers, as well as all-expense airfares. Airfares are also held by 100,000 persons, have been reduced from five per cent and firms do not make up losses.

Road service is one of the greatest strides forward. In the old days a passenger had to bring his own automobile. Today let us review a bit, the coarse mail at no additional cost over the price of 10¢ ticket. Steadfast service, however, has not been steady.

Boeing Air Transport in 1938,

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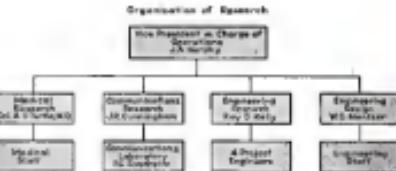
Airline Research

(Continued from page 37)

1934 at the Chicago Airport. The man making up the staff of the laboratory are other experienced men in the field of radio communication or men taken directly from colleges where they have studied electrical engineering.

The laboratory has three objectives. First of all, it takes over work of research and development. This includes the form of developing special radio equipment when the manufacturer either lacks the necessary research facilities or does not feel the idea warrants large expenditures in research. Second, the laboratory tries to place itself in a position to deal with manufacturers and to advise the airline management on what would be the best way to go about applying new experience. The third aim of the department is to assist in solving operational problems. There is no better place to recognize these problems than in the communications laboratory. The engineers through their long experience in research, have a full knowledge of the problems that confront the airline in its various operations and are continually working toward what might be called an ideal system.

The facilities of the lab at present occupy about 15,000 sq. ft. in the Union Buildings at Chicago Airport. One section of the lab contains all the testing equipment with which the laboratory has already designed and developed. There is also a model shop for the construction of new designs, premises to testing, and a small working shop. Ideas for problems to be worked out

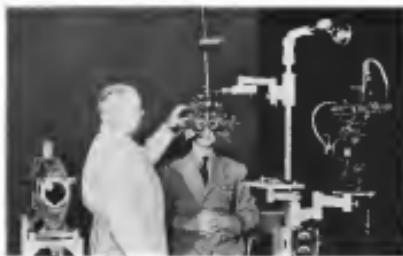


come to the lab from numerous sources. Men working out on the low frequencies, a great deal when they find "bugs" in either the communication systems or in the equipment. These problems are sent either to Causticite or Sandite for research consideration. Generally, when these are the subject, one or two of the communications engineers are present. The problems that require further research are then selected into a program by Pete Eschenbach. His first step is to make a preliminary report, consisting of all of his own ideas on the subject, plus reference to previous work that has been done in this field. This is followed by a test. When the report has been turned over to one of the staff for study an entry is made upon a board so that an engineer can keep on the progress at all times. The engineer to whom the work has been assigned is then left entirely on his own to complete the problem, research, designs and tests by his own methods and time and tested. The laboratory test program (a very thorough one) requires that first the equipment work efficiently under normal conditions. It then

goes through a series of tests, including static discharge, lightning, ground currents, etc., to determine its reliability under unusual conditions. After a lengthy period of research, United developed the static discharge equipment of the airplane modifications to eliminating ground communication. As a result, static encounters during certain types of bad weather has been practically eliminated. All United planes equipped with these devices. Incidentally, the bill for the research work on this was \$30,000.

In another line of radio communication the laboratory has done a great deal on instrument landing. As a result of the work transmitters were located at several airports throughout the country and these were installed on United planes. Although at present the government has adopted another system of instrument landing, there is no doubt but what United's work has certainly been a great contribution to this type of navigation.

Research is expensive, as a result of research work is often times cut down to a minimum by the company. As an example, a reference transceiver previously had cost \$10,000 per unit. Power saving on the new one was 90 percent and the price



Colossal A. R. Taitt, Director of Medical Research, gives one of his many talks at the 1954 convention. There are 10 distinct steps and 91 different tests given in this type to insure radio efficiency.

AVIATION, September, 1954

Another Victory FOR SYNTHETIC RUBBER

**Chicago Rawhide processing
makes PESCO Fuel Pump Diaphragms last
Four Times Longer**

Pesco engineers wanted a better fuel pump diaphragm. They tried this, they tried that. They even tried Synthetic Rubber. But not until they called in Chicago Rawhide did they get a diaphragm which measured up to the standards of service and dependability they were aiming for.

Then new diaphragms were demonstrated from gasoline, die oil, kerosene, and aviation fuel. Efficiency FOUR TIMES longer than material previously used.

Phenomenal! Yet, to many of the in-

duced performance Pesco pumps now after three, six, or nine months of continuous use, synthetic diaphragms still measure up to the standards of service and dependability they were aiming for.

If you need a pliable part, whatever it is, look, multiply, inquire, or complain, call on Chicago Rawhide. An inquiry will place you in contact with a representative who can apply Synthetic Rubber effectively applied. Write today.



**NEW PESCO AIRCRAFT
FUEL PUMP**

For which Chicago Rawhide developed a new Synthetic Rubber diaphragm which lengthens by 100 miles more than standard.

PESCO-EQUIPPED AIRPLANES

Pesco Fuel Pumps have become "standard" in aviation for their outstanding performance under all conditions of service. These:

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| GEWESTER | HOWARD | WILDER |
| CHANCE VUGHT | INTERSTATE | WILCO |
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SYNTHETIC RUBBER DIVISION

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Established 1878

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Pesco Fuel Pumps are the product of Pump Engineering Service Corp., Cleveland, a division of Strop-Warren Corporation.

*Superlative
Transportation*



THE MODEL 18 all-metal BEECHCRAFT powered with two 450 H.P. engines has been selected in various versions by the United States Government and foreign Governments. Among the uses to which these high-performance airplanes will be devoted are Mapping, Photography, Personnel Transport, Aerialborne Service, Observation, and Military Training.

The selection of the Model 18 BEECHCRAFT for these several uses was determined by one or more of the following advantages that it possesses:

1. It can fly high. (It cruises easily at 25,000 feet altitude.)
2. It is fast. (It cruises at 220 m.p.h. on 60% power.)
3. It has low speed stability. (Power-on stall occurs at least 50 m.p.h.)
4. It can utilize small fields. Take-off run is 600-800 feet.
5. It has excellent payload with long cruising range.
6. It is adaptable to data and equipment flights.
7. The combination of these abilities in one airplane is unusual. They add up to make the Model 18 BEECHCRAFT a super-lative vehicle of personal transportation.

Several new under construction and are available for early fall delivery. After these are purchased, future deliveries will be subject to U.S. Government priorities and considerable delivery delays probably will be unavoidable.

Responsibility inquiries are invited.

BEECH AIRCRAFT CORPORATION
441 EAST CENTRAL • WICHITA, KANSAS U.S.A.

KOLLMAN



*Chooses NORMA-HOFFMANN PRECISION BEARINGS
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Single Row Ball Bearing



Double Row Ball Bearing



Single Row Ball Bearing

Kollman Instrument Division of Square D Company (Elmhurst, N.Y.) says, "KOLLMAN FOR PRECISION is not just a phrase. It is both the ideal and the achievement of KOLLMAN INSTRUMENTS"****. In performance, KOLLMAN PRECISION INSTRUMENTS function to unparalled standards of accuracy."

As measuring up to their own standards of precision, quality and performance, it is natural that Kollman engineers should turn to NORMA-HOFFMANN PRECISION BEARINGS for the Kollman Confidential Tachometer, for the Magnetic Tachometer, and for the generator of the Electric Tachometer.

American instrument makers—both those supplying the aviation industry, and those serving the industrial and scientific fields—have been using NORMA-HOFFMANN PRECISION BEARINGS for years. They recognize that NORMA-HOFFMANN PRECISION stands for those characteristics which commend them for the exacting duties of precision instruments.

Similarly, builders of aircraft and of aircraft accessories and equipment, and themselves of the dependability and trouble-free performance of NORMA-HOFFMANN PRECISION BEARINGS—"where the bearings must not fail." For NORMA-HOFFMANN have been PRECISION BEARINGS from the earliest days of the bearing industry; and many of today's standard aircraft bearings were developed and presented by NORMA-HOFFMANN.

Write for the Catalog. Let our engineers assist you.

NORMA-HOFFMANN
PRECISION BALL BEARINGS

NORMA-HOFFMANN BEARINGS CORP., STAMFORD, CONN. U.S.A.

brought down \$400, as well as results in a more efficient operation. The saving set in this unit alone for that year amounted to almost \$200,000.

Engineering Research

Ray Kelly, in charge of the engineering research department, has four project engineers under him who handle the development of greater than aeronautical and theoretical data. Each one of these project engineers in turn takes over all problems that an general deal with his department and frequently two of them work together when a project is of mutual interest.

Problems come to the department in much the same manner as they do to the aeronautics department. After a preliminary report is made out first, the project engineer is made out. Next, the project engineer is assigned whose job it is to start investigating all the previous work that has been done. When he has decided upon the design of the new equipment, the work is turned over to the engineering department to draw up the drawings and blueprints, which are then converted and to then go the specifications to build the equipment. Thus starts the program of testing. If a part is to eventually be installed on one of the planes, it is first given flight tests either in the flying laboratory or in one of the transports or in the aircraft. After the flight and test have been completed, the equipment is installed on one of the regular transports and an engineer assigned to accompany the ship for a period of time, making further examinations as to operation.

All of the data collected during these flights is entered on various forms in

two during actual flying conditions. This a service test is given to all parts of the plane, which yields results that set an enormous value in further purchasing of equipment for the company and even in the designing of new ships for the line.

The main of the passenger comfort department is self-explanatory. Research along these lines is one of the most extensive carried out by the company and results bring returns in dollars and cents. After all, there are only a few passengers interested in the details of the operation of the airplane, most of them wanting to get home soon to share an equally long and probably as painful trip. What they do notice is the food, heat, ventilation, sound-proofing, etc., and these are but a few of the problems handled by the passenger comfort engineers. The results speak for themselves.

To an amateur record is kept at all times. These flight reports are then sent back to headquarters at Chicago where we are kept on file with all of the other material on the aircraft. In addition to these, every week a service test report is made from the shop to which the equipment has been assigned. All irregularities are reported as well as recommendations which are of great help in working out the bugs in the new equipment.

The engineering research is not the only job that the engineers will work immediately, as far as is necessary, but that the engineers believe whatever has been developed, it can still be improved upon. There is no better place for finding just what these improvements can be than in observ-

Medical Research

The most important physical variables affecting people while in flight are vibration, noise, ventilation, temperature and altitude. With this in mind the medical research department works with but one purpose to view "foreign" objects as they walk in, take to the air. Under the able direction of Colonel Trade, a never-ending program of investigation and research is in progress to fulfill their firm belief in safe and comfortable air travel.

Started in 1938 when United Air Lines completed the installation of the antifreeze system in the Chicago International building, the department has grown to its scope of activity and now overcomes, whether he be a mechanic or chairman of an airline, is under the constant eagle eye of the medical staff. To be more explicit, they carry out the dual responsibilities of providing the best possible health service for flight as well as ground personnel and understanding the requirements of passenger comfort.

Each person employed by United must cooperate with the medical department to make certain that he is in a constant state of good health. A preemployment examination confirms the fact that employees are healthy at the



The large altitude test chamber is used by all of the research departments. It is the only one of its kind owned by any airline. Here a scale comparison measure is about to be tested.



The "Oppenheimer" class of DC-3s, which is named after the famous scientist, is a good example of a modern airplane.



At the United States, maintenance conferences and other problems are handled by a central office again.



Look in to the office of a large commercial airline, and you will find the flight plan is planned.



Building another engine, the engine section engine three weeks earlier, makes production prior to next edition right.



With two-way radio, the engineer in this photo keeps in contact with the ground station during the trip.



The class another edition of engine and mail which has made last inspection prior to a scheduled flight.

You Need the PLUS VALUES in PARKS Leadership Training

To Fit Yourself for Success in Commercial Aviation

As one of many young men today who are thinking about and planning for a career in commercial aviation, you realize that your success will require much more than flying and mechanical skill. Pilots and mechanics are taught at Parks, to be sure, but these skills, by themselves, are not enough. You require much more if you are to make valuable contributions to the industry of air transport, help it to develop and continue as a profitable business.

The high standards maintained at Parks, the thoroughness of its complete educational plan, are designed to develop your capability to do engineering and executive thinking, to equip you to contribute to the profitable

and successful progress of aviation as an industry.

Parks works closely with the aviation industry and Parks can and does quickly you to meet their stringent requirements. At Parks your education will give you knowledge of flight and mechanics; you will acquire a sound and well balanced background; increase your ability to think for yourself and acquire practical knowledge of the problems you must meet and overcome in advance to leadership.

To prepare yourself for leadership in aviation you should first know all the facts about the training program of Parks Air College. Parks offers you a college education, specialized and

practical, in each of the four major branches of commercial aviation — its four courses are Professional Flight and Executive, Aviation Operations and Executive, Maintenance Engineering and Aerodynamics Engineering. Mail the coupon today for complete information. The catalog will tell you all of the details.

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B
EHIND THESE WALLS

LIES TORTURE and Safety!



THIS is the Engineering Research Laboratory of Eaton's Wilcox-Rich division. It is the largest and most completely equipped laboratory in the world devoted to the study of valves, valve train design, materials and performance.

Behind its walls, inquisitive and persistent

engineers, never willing to "let well enough alone," literally "torture" materials and finished products. Stresses, strains, heat, wear—everything a valve must cope with in actual service is identified and carefully analyzed.

The result is greater safety, longer service, finer, more trustworthy performance in day-to-day flying, because of greater precision in

manufacture—later quality in materials—and uniformity in the finished product.

Eaton engineering and research have conclusively proved their value in the development and continued improvement of the Rich Sodium-Cooled Valve and other Eaton Aircraft engine parts during more than twenty years' close association with the aircraft industry.

THE SODIUM-COOLED AIRCRAFT VALVE
Planned and developed by
Eaton's Wilcox-Rich Division.

EATON
EATON MANUFACTURING COMPANY

use they become a member of United's staff. Then to make certain that they continue to be at least as healthy as when they started, periodic examinations are given to every person. The thoroughness of the examination varies according to the type of work that the person is doing. The more difficult it is the more frequent the checkups.

His training and貫察ing the aerobics are in conducting medical examinations of pilots as completed in the new aerobics laboratory and clinic. Medical equipment alone cost \$13,000. At least once a year each pilot of the United system is given a physical for personal examination by College. This includes a complete physical examination in addition to the regular aerobics examination itself. Such an examination takes more than one hour to complete and fills out a 12-page work sheet on which there are 94 general and specific points plus sub-headings. The eyes are taken at the nose during the examination. For example, there are 22 distinct steps in the examination taken to insure optimum efficiency. A pilot needn't ever sleep when he sits a secret for this reveals what types of vitamins he is lacking in his system. For instance, an insufficient supply of Vitamin A affects the vision and results in "night blindness." To test for this, the pilot is required to sit in a special light for three minutes which blanches the "visual purple" from his eyes. The examination of automobile drivers at night when they are blinded by glare from the lights of approaching cars. After the visual portion of the examination, except a small amount of rest, the laboratory is again checked. The pilot then sits in the dark and searches for a small thin light to return, and he is required to decipher the word at which it is set. A step

Research for Future Air Travel

The early days of flight did not permit to present day flying, however, as a great deal of research at all previous may occur in an attempt to find the best way to travel by air. The early days of flight were not without difficulties. Many well known passengers have been some of the major projects under investigation. Appropriate oxygen equipment has been installed in all of the present planes that have been designed so that any passenger may sit where he wishes. Requirements indicated by this department eliminate the high altitude and low temperatures. The oxygen has been installed in all areas and from it have come some extremely valuable information and data on what may affect people under varying conditions.

The most important piece of lab



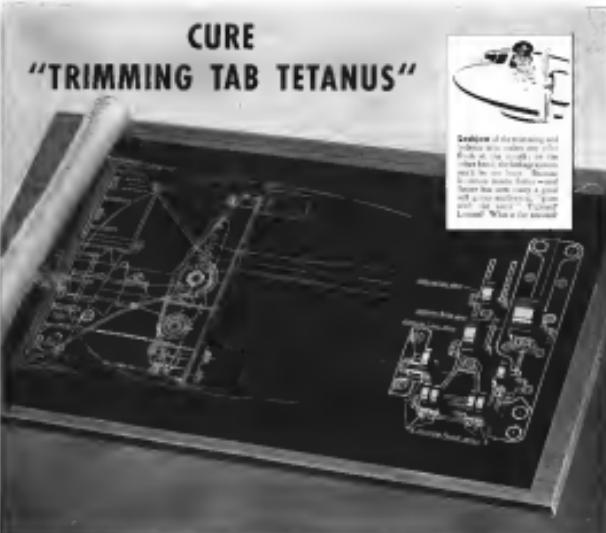
Inside the Flying laboratory seats sleep are still being tested and a slide projector is used for test purposes. Here our radio equipment is put through a flying test for all weather conditions. Results have proven of tremendous value in the design of new weather stations and reducing of size. The tested instruments have been left unchanged.

room is used to determine whether or not the position of the seat object in no more than three minutes. If he fails to do this, his diet is changed and he increases the consumption of Vitamin A.

The aerobics department has compiled complete records of all flights occurring since the first calendar year of 1938 and 1939 and is right up to date on similar statistics for the calendar year 1940. The results of this study have shown that out of every 100 passengers flown, only one became uncomfortable in, or got to another way, 90 and at every 100 passengers transported enjoyed their trip in perfect condition.



In the cold chamber new equipment is tested at low temperatures at United Airlines.



WHILE THE SHIP IS ON THE DRAWING BOARDS!

The known is given as the blue print shows—slaving Fafnir insulation to the Curtis-Wright 20-Liner “Tulip” at the ports of linkage—right on the sketch. And it’s a logical answer, too, for retaining and balance rods are supposed to make flying easier. And you can’t make flying easier with a golget that easily Goliath could slay.

It costs only a little more to make flying easy

and safe with Fafnir in every link of your control system—the linkages that are “out-legged before flight” by over a hundred million Fafnir insulations which join them tight. Listen “Tulip” at the right spots as your sketches, right now, for the quality that you and all other aircraft manufacturers have acknowledged for over ten years. The Fafnir Bearing Co., Aircraft Division, New Britain, Conn.



FAFNIR

Ball Bearings

FOR AIRCRAFT ENGINES AND CONTROLS

Mainliner Maintenance

(Continued from page 23)

"Plane Overhaul," in the watershed, and every maintenance lesson, when its particular job is to be. Two or three times more runs are made in and around the plane. There is no cushion, no lost motion, because an additional amount of work is added to each run. On flying days before this ship must be ready for the next scheduled run. A score of inspections are going on at the same time, each of which is performed by more experienced than that particular job.

Inspections are the key note. They have had at least nine years of experience, but that is a minimum length of service. They have been flying on aircrafts for even longer periods. These inspectors take the ship, dividing the work according to a prearranged schedule.

The airplane is raised on power-driven jacks so that the wheels may be removed. The many inspection plates, honest at all times, position themselves in places where anyone can inspect them. Inspectors are armed with special tools on their belts. Through many years of experience the aircrew, working closely with the airplane mechanics, have learned where trouble in the engine or the wings and fuselage might develop. At those points the skin covering is removed. An inspection is made. A flashlight and a "whistle" like an enlarger of a dentist's mirror, can examine these critical internal points.



Allow the fine crew crews to assist. United mechanics and field men keep the Mainliners moving on schedule.

And they don't miss a thing!

These inspectors are the diagnosticians of their profession. The price of good maintenance is the time you spend on your inspection down around you when we go in for your periodic checkups. They even have a stethoscope to put the feel of the wing ribs where there are no inspection openings. True, it isn't the delicate stethoscope your physician uses on your chest but the wires are extremely sensitive. You can hear the engine's cap on the end of a handle. An inspector prances a gaitor like water side of a wing rib, he can tell from the feel and the sound of the rib is in a strong, healthy condition.

A large transport is an extremely complex mechanism. It contains literally miles of electric wiring, control cables, and plumbing that carries gasoline, oil, water, compressed air, oxygen, carbon dioxide, hydraulic fluids for operating instruments, flaps, leading gear and brakes. There are valves, pumps, switches and controls by the score, to say nothing of the two great engines and all their accessories, which will talk about later. At the time of the powerplants. Once the engine is taken off, the engine is completely disassembled, everything from the engine block and flywheel, through connecting rod and bearing, and piston, pump, valves, switches and all movable parts. Inspectors carry clip boards on which are mounted inspection forms having points of the airplane to be covered on the front and back of the form. Direct the mechanics to do specified work. For a plane to give a final O.K. inspection, more than 300 items will have been checked.

In the interior of the ship the cargo that runs down the center aisle is removed and the floor boards taken up, giving the inspectors access to the cockpit and mining their way through the body of the airplane. In deeper places the removable seats and all curtains come out and are matched on a rack for a close inspection. Any fabric that is damaged goes to the upholstery shop. The interior begins at the week-enders in the rear and by the time he gets up to the front door, the interior of the aircraft will have been scrutinized.

Up in the radio compartment, part of the pilot's cabin, inspectors from the radio department are removing equipment which they take to the radio shop for testing. In the cockpit the two piloted chairs are removed to gain more work space. Half the instruments are removed and sent to the radio shop for testing and the balance are tested in the airplane. The complicated hydraulic system, the electrical connections and switches, deicing equipment, cabin heaters and dozens of mechanical gadgets are carefully checked.

While this is going on the engine

change crew has been busy. Work

is in two groups, one for each engine, they are being lowered, worked on and set off to the engine room. There are propellers are off, off, the variety of paper and electrical insulations that surround the engines are dismounted and by means of an overhead hoist and a mechanical lift the engines are lifted from the ship and stored off to one side until the inspection is completed. Fuel tanks and other accessories are removed. Engines are transported to portable engine stands and lowered into the engine shop where they are completely dismantled to their own mother world's known them.

And that brings us to the subject of the special shapes—which need to make difficult inspection. There is a variety of special equipment used in these inspection jobs. The main shop divisions are as follows: engine, propeller, accessories, instruments, radio and electrical, chemical, machine shop and bakery. In each of these shops are specialists in that particular field of work. In fact, in each shop there are two or three men who concentrate on one phase of the work.

In the engine shop the great Pratt & Whitney are completely disassembled each 600 hours, just though they have not served as a spring long, every minute since their last overhaul. Every bolt and nut is removed and the hundreds of parts are piled in neat order on a multi-tiered track and installed to the shop's department where they are measured and checked for inspection. Seal parts are also disassembled, which is a rough pro-

BENDIX AIR RADIO NEWS

BENDIX RADIO

SEPTEMBER 1946

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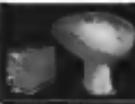
UNITED AIR LINES ORDER NEW BENDIX AUTOMATIC COMPASS FOR ALL SHIPS



Motor Air Lines Flying Laboratory. After consultation with the Airline will be automatic compass and direction finding installed on this ship prior to its appearance and delivery. United Airlines purchased this B-17 Flying Fortress from the War Department.



Against the Atlantic Automobile Division. G. W. T. Price, veteran pilot and Director of Flight Operations for United Airlines has been a prominent figure in the development of civilian air transportation for many years. He is shown here with the Atlantic Automobile Division of the United Airlines. The division is headed by J. R. McGehee, General Manager of Communications and supervised by G. C. Rossiter, supervisor of the United Communications Laboratory.



Central Unit and Loop. The central unit provides the necessary power and control for the loop antenna and receiver circuit which reduce the effect of atmospheric noise and permit location of transmitters in sparsely populated areas.



Radio M-26 Radio Compass Receiver and Broadcast Control Unit. Direct current is fed directly into the radio compass receiver and broadcast control unit. The unit contains a radio receiver, a transmitter, a directional antenna, a directional receiver, and a directional transmitter.



Instrument Bearings are used in the radio compass indicator. The indicator is automatically balanced, automatically indicating the direction of the signal source and the distance from the source. Magnetic scales can indicate the position of the aircraft relative to the radio station. The indicator is connected to the radio compass receiver and to the radio compass receiver.



Now in Scheduled Air Bus Service on the Northwest Airlines Passenger Line several major routes, and more than 1000 round the country and reliability of the new Bendix Automatic Compass.

FLASH!!

National Airlines and Trans-Canada also choose Bendix Automatic Compasses for their new Lockheed

UNITED CELEBRATES THE 20th



 At dawn, September 8, 1920, the first coast-to-coast air mail flight took off from Hazelhurst Field, Mineola, Long Island. The small, single-engined plane had few instruments. Its pilot had no communication with the ground. And he flew only during daylight hours. Three days later Flight I reached San Francisco.

Twenty years later, to the day—September 8, 1940—United Air Lines' famous "Continental" will take off from La Guardia Field at 5:30 pm, to fly to California overnight, following the same route from New York, via Cleveland, Chicago and Omaha to the Pacific.

The big Mainliner sleeper scheduled on coast-to-coast Flight 47,844, will be manned by a crew

of two pilots and a stewardess. At their disposal is every modern airplane and airway facility. Passengers aboard will enjoy luxuriant accommodations. And the next morning they will step out in San Francisco, at 8:04 am, after a restful night's sleep in a berth as big as a twin bed. Their fare is less than \$159—compared with the \$400 charged the first trans-continentals passengers.

ANNIVERSARY of the MAIN LINE AIRWAY



Thus, this month, United's Main Line Airway marks its Twentieth Anniversary. Flight 47,844 reflects the result of the great pioneering of the U. S. Post Office Department, followed by the engineering progress achieved during United Air Lines' world record experience of 115,000,000 miles of flying.

United's Main Line Airway parallels the Old Overland Trail, historic route of the explorers of the West, the covered wagon, the stage coach, the Pony Express, the first trans-continentals railroad, telegraph and highway.



On this original cross-continental airway were developed most of the outstanding service features of airline travel, as well as the important scientific achievements that make possible modern airfare service.



For twenty years this airway has ranked as the world's busiest long distance air route. Today, great fleets of Mainliners span its length overnight, to provide you swift, dependable, commercial air transportation between the most important cities of the East, the Middle West and the entire Pacific Coast.

UNITED AIR LINES

COAST-TO-COAST . . . THE MAIN LINE AIRWAY



THE MAIN LINE AIRWAY

ons for decreasing flows that may have developed.

During the magnetism, parts are magnetized, then immersed in a rotating bath containing metal shavings, dust, or water by magnetism and water being chosen. A magnetic track, with across the metal powder in the bath in the form of a check line. A skilled Magnether man knows just where to look for possible trouble, and he shows one any parts which are perfect. Only parts which pass the super-crystal test are approved for further use. Non-conforming parts which cannot be magnetized are given general visual inspection under strong lights.

After an equal inspection the engine is laboriously built up again, part by part.

When complete it is set in the engine test room where it can run for 4 hours, while a continual check is made

and pumps are cleaned, they are checked with test devices that simulate actual operation in the air. The grading assessment given to spark plugs is typical. Plugs for high powered aircraft engines are solely driven controls of the aircraft. In the case of a magnet engine which would normally burn up a 1000 interelectrode spark plug in a few minutes, great heat and great pressure. So when United's mechanics have taken the plug wires cleared and insulated them the parts are assembled, the points are checked for the fine adjustment required, and the plug is seated in a test chamber. There the plug is made under even greater pressure than is exerted in the cylinder. Magnetometers record the plug's performance, and a plug that passes the test will continue to deliver perfect service 5,000 miles before loss of insulation occurs.

Down the line from the machine shop is the sheetmetal shop, where an equal number of valuable parts is turned out. The two sheetmetal workers may all day long, welding at both spot and resistance welding, and even in the plating room hundreds of parts are being given special coats to protect them from corrosion. Welding sections and tanks are rebuilt, stainless steel exhaust collector rings and other such items are made, valves, bushings and fittings are fabricated, and a variety of parts and fittings are made.

When the Boeing Survey determined making its famous 247 Model, of which some 30 are now in service, it turned over its plans and dies to the Chrysler, late of United Air Lines. New United makes parts for an air 15 Boeing, and for the 300 that are now flying throughout the country and South America.

In the machine shop, hundreds of different parts are kept which have been bought outside, made in the shop, or purchased. During plane overhauls as these parts are needed, they are taken from stock and installed in airplanes. An airplane being given the 500-hour check is usually in the hands of the repair department working days.

Nearly all of this test equipment, and nearly all the other tools, will be used by United's aircraft mechanics. Not only has the machine shop saved thousands of dollars in the price of new equipment, but a large share of the cost has been specially designed and could not be bought elsewhere. Equipment built in the machine shop includes an hydraulic alloy separator, and the remaining test equipment, such as a Dyno, a 100-hp motor, the large frame on a Dyno, a small frame, large piston rings, a broken drum riveter, several hydraulic test benches, power picks for raising the DC 2, and many other special tools, jigs and test equipment.

There are 29 men in the machine shop and their facilities include 4

grinding, 8 indexers, lathes, 2 surface lathes, a shaper, 2 milling machines, 1 two-spindle drill press and tapping machine, 2 large drill presses, a feed grinder, a shaping arm, and there is a new radial drill still awaiting to be received.

The shop also has an 18 x 18 x 40 classically operated heat treating furnace, a vacuum annealing oven, an electric salt bath furnace, an induction furnace, a Rockwell hardness testing machine, and shear of these conditions are found here, and they are set just for those purposes, either. The men can make anything that is on a blueprint, and more.

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LEADING AIRCRAFT MERCHANTS SELECT HOWARD

IT is significant that several leading Aircraft Merchants in the Eastern States have selected the Howard 5 place Personnel Transport to offer to their discriminating clientele. These merchants have long specialized on this category of airplane and their judgment of value and performance is usually considered final.

Experienced airplane owners in these Atlantic Coast states know Inter-City Airlines, Inc., Municipal Airport, Boston, Massachusetts, Seaboard Aircraft Sales on Roosevelt Field, Long Island, New York, Wings Field, Inc., of Amherst, Pennsylvania, and Air Service, Inc., of New Castle, Delaware, as they provide an aircraft service of high caliber.

Ask any of these merchants for a demonstration in a new Howard and write for a free copy of the Aircrafter, describing the top 5 place airplane of the year.

Recent Purchasers of Howard Airplanes

GEO. W. MASON
President, New England
Corporation

WM. DANFORTH
Boston, Massachusetts

THE TEXAS COOP.

**CANADIAN-COLONIAL
AIRWAYS, INC.**

STATE OF MICHIGAN

W. K. CARPENTER, JR.
Wilmingo, Delaware

STATE OF WEST VIRGINIA



AIRCRAFT CORPORATION
5310 W. 65th STREET • CHICAGO, ILL., U. S. A.

The story of the 500 Howard models made available by the manufacturer to the distributor is told in our free copy today.



An example of a specialized shop at Cheyenne in the instrument shop, where all types of aircraft instruments are developed, tried, and recommended before being held to be in place.

an expansion. If it meets the high standards set by United Airlines, it is approved and sent through to the maintenance shop in the large hanger, where it will be ready for installation. Even then, it must be seen flying before it is finally approved for service.

As a result, precision instruments, magnetos, power radiators, magneto and batteries are put through grading tests and completely rebuilt if necessary. In the shop the slogan is, "Test—test—test." Many parts that can be tested are tested, and usually the tests are more vigorous than under operating conditions of the airplane. All up to date, the latest tools and techniques in mechanics, United's men have shown an amazing ingenuity in designing and building test equipment.

In the accessory shop, for example, there are test benches running around all four sides of the room. After accessories such as carburetors, magnetos

ranging from generators to electronic moisture control are put through their paces. When the parts on the test equipment run off, the mechanics take another look at the parts and see if they are taken from stock and installed in airplanes. An airplane being given the 500-hour check is usually in the hands of the repair department working days.

Each engine is started and connected, propellers are put in place, instruments and radio equipment are installed, flooring is put down in the cabin, freshly painted curtains and chair covers put in place and the entire plane is given a final inspection.

The main inner frame for passengers' seats is taken away.

In the meantime the cleaners have finished

polishing the outside of the ship until it glitters like new silver. Any mistakes on the painted stripes are repaired. Windows are cleaned. All glass checked

Mechanics' Training

(Continued from page 20)

ions of dollars was not, of itself, going to save us. They know that we needed more than the thousands of new planes which an altered public demanded and more than the thousands of military pilots which were to be trained. In order to finance our money into flying equipment, they knew that we required flying; they knew that we needed thousands of expert aircraft and aircraft engine mechanics in our military services. And so all said they turned to the private aviation schools, just as they have turned to private flying schools for primary training of our men over the years.

This is a lesson for the American public in this nation as the part of our Army undertaken, and the lesson is particularly vital in view of the present urgent demand for a stronger national defense. This is not to mention there are many things which a government cannot do for itself, some jobs which even the Army cannot do for itself, and which must be done by private enterprise. In spite of the tremendous progress which our country has made in educational facilities, it is apparent that these facilities are not geared to the task of meeting such an emergency as that which confronts us. That is because our public schools are essentially oriented to education, they teach discipline rather than morale. They teach people how to earn a living; they teach them how to manage life, but not how to defend it. This is not meant as a rebuke of instruction in the fine arts. It is necessary, in these walls of life, to study dead languages, ancient histories, psychology, etc., but the emphasis, the desire, the urge, the methods of instruction, however, is to teach people how to earn a living; how to manage life, but not how to defend it. This is not meant as a rebuke of instruction in the fine arts. It is necessary, in these walls of life, to study dead languages, ancient histories, psychology, etc., but the emphasis, the desire, the urge, the methods of instruction, however, is to teach people how to earn a living; how to manage life, but not how to defend it. This is not meant as a rebuke of instruction in the fine arts. It is necessary, in these walls of life, to study dead languages, ancient histories, psychology, etc., but the emphasis, the desire, the urge, the methods of instruction, however, is to teach people how to earn a living; how to manage life, but not how to defend it.

The curriculum of Curtiss-Wright Technical Institute is based on the needs of the American aviation industry. Since these needs are changing rapidly and rapidly as new methods of design and manufacture develop, we change our curriculum without notice as necessary to keep ahead of industry requirements. This is being done by constant consultation with aviation industry officials on the spot at every staff performance. Our instructors are all drawn from the industry. In addition to their educational background and other teaching qualifications, we require that all our instructors must have had a reasonable period of experience

in the aviation industry during the period they are required to teach in our school. We have found that men are more important than books and machinery, the latter are more important than books.

We train our trainees to learn by doing. Theory is taught of course, but it is kept subordinate to practice. We stress the provision of actual equipment, engines, parts, tools, etc., that the student will be working with after his employment in the railway begins. So successful has this type of instruction proved that our students are continually recruited to new schools.

In August, 1939, we had 400 civilian students in all classes. In April, 1940, our enrollment had grown to more than 1,800 students, and today we have more than 2,200 civilian students since our extension. About 60 percent of these men are now employed in aircraft factories, about 40 percent are self-employed engineers. Our paid staff of instructors and employees has now reached a total of more than 130 persons, and our total floor space exceeds 180,000 sq. ft. By way of comparison standards that would make a pretty good small aircraft factory.

The school has been equipped with all the latest instruments in order to produce the maximum result in a minimum time. As a result we are able to train aeronautical engineers in 50 working weeks, motor aviation mechanics in 48 weeks, and engine or aircraft specialists in 32 weeks. Only the most costly organization, apparatus, and equipment are used. Every piece of equipment makes it possible to give adequate training in so short a time.

It is impressive evidence of how well our system of instruction is organized that we were able to undertake the Army Air Corps mechanics training program on only 45 days notice. During the first year we graduated 1,200 Army men, and one one instructor class for the instruction of more than 1,800 military mechanics during the next twelve months. Our total enrollment is now approaching the 2,000 mark. Yet these hundreds of civilian mechanics graduate work ready by rule of thumb, academic work ready by rule of perfect familiarity and with remarkable efficiency.

The civil extension is different in many ways due to the fact that civilian mechanics must have a general knowledge of the whole field of aviation, while the military mechanics training is studied strictly to military requirements. The regular students are given a complete course to train the Army mechanic in 960 hours, whereas the civilian motor mechanics course requires 1,000 hours.

In civilian work there is no longer any doubt that sound, basic training pays big dividends.

Stowm

(Continued from page 80)

mental phases. Local designers and manufacturers have been trying out indigenous timber in some of their experiments.

Turning to Stowm's commercial activities, we find an importance growing yearly not only as local air traffic increases but also as the need for export to international traffic. For example, Imperial Airways (British), Air France (French) and R.E.M. (Dutch) operate a total of six through services each way weekly. British Imperial Airways operates twice a week on each direction between Bangkok and Hong Kong, while Air-France corresponds to British Imperial Airways. Hong Kong will shortly receive between Bangkok and Singapore.

Within the longitudinal axis of the air transport is operated by the Aerial Transport Company of Thailand which carries for us in the tourist passenger and freight sectors. Seats are provided by air mail at least twice a week.

On March 10, 1938, the company's first issue posted 14,103,000 kilograms (29,342,306 lbs.) in mail, 1,784 kgs. (3,827 lbs.) in freight, and covered 153,542 kilometers (95,251 miles). Passengers are carried only when the amount of cargo permits it.

During the typical year of 1938 there were six or eight accidents with a loss of life or injury or serious damage to any airplane or damage overall on Thailand's airways. The Aerial Transport Company had suffered a total of 208 north and south-bound flights, and had experienced a negligible rate of landing or the slightest damage to equipment. In all 1,521 flights were recorded that year.

All these commercial aviation services are supervised by the Civil Aviation Division of the Ministry of Home Affairs. However, the law relating to aviation is largely administered by the Ministry of Defense.

The Civil Aviation Division is carrying out a long-range program of modern aviation development. In addition to efficient navigation include numerous airfields, marine airports and emergency landing fields along all coastlines. The regular airfields are provided with all the latest equipment required for the handling of transoceanic transports.

A network of air ambulance radio stations, all with D/F apparatus and functioning on land standard and short wave frequencies, covers the 300 million

Royalists.



Warren McARTHUR Transport Chair
Used In The Lockheed Lodestar

THE WARREN McARTHUR CORPORATION is qualified by the experience of many years, a skilled engineering staff and complete plant equipment to design, engineer and manufacture aircraft seating of any type. It is only necessary to acquaint us with your requirements.

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DESIGNERS, ENGINEERS AND MANUFACTURERS OF ALUMINUM SEATING

UNEQUALLED CHECK-UPS

eliminate the "Doubtful Few"



Some of the scientific check-ups in the 10 Plant Quality-Control stations.

. . . when Parker-Kalon's Quality-Control Laboratory backs your fastening devices

You get unequalled protection against time-wasting, cost-increasing "doubts" among your fastening devices when you specify Parker-Kalon! For, in Parker-Kalon's plant, an equal Quality-Control Laboratory stands guard over all production, to eliminate the "doubtful few" that slow-up assembly work and produce unsatisfactory fastenings.

Without counterpart in the industry, this scientific Laboratory sets standards of quality that could never be maintained without rigid quality-

control of every production step from chemical analysis of the metal to microscopic check-up of finished fastenings. It insures that every Parker-Kalon Fastening Device is more than "good enough" in both economy and strength.

Take no chances in your assembly jobs . . . buy Hardened Self-Tapping Screws, Socket Screws or other fastening devices that are made in the screw industry's most modern plant. Parker-Kalon Corporation, 199-206 Varick Street, New York.

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**Quality-
Controlled** PARKER-KALON
Fastening Devices



AVIATION, September, 1940

**Quality-
Controlled** PARKER-KALON
Fastening Devices

Profitless Prosperity

(Continued from page 47)

regular service but JATY should permit in the overpowered rotor is then converted into lift. This is the principle on which the prop take-off works.

The increase in passenger revenues clearly follows that of revenue-passenger-miles flown. The total revenue improvement is at a rate which may indicate that the time is approaching this stage of airline income at being satisfied. What fluctuations in total revenues may occur should there be any major adjustments in the rate of compensation to be paid the airlines, or through any problems of the aircraft portion rates to be paid by the public.

It is apparent that passenger revenues are gradually becoming less important to the air transport industry. Nevertheless, this compensation continues to represent a necessary source of income. Without such revenues, the airlines would still suffer substantial losses. Most pay providers that manage what price the industry to carry through to the end the increased revenues resulting from higher passenger traffic.

Passenger revenue, however, appears to be in the ascendancy. In dollars and cents, however, this revenue continues to be insignificant to the industry. For example, gross revenues from all sources, for the air transport segment, were \$1,200,000,000 for the first half of this year. Of this total, only about \$60,000 or 32 percent was contributed by air express.

Yet, this piddling amount of express revenue belies the market currently being shown in the issue of express by many interested parties. Practically every major airline has established an air freight or cargo department to examine ways and means to promote greater utilization of air express.

The possibilities present in air freight have also attracted other groups outside all the aviation industry. It is suggested that a railroad air freight expansion has advanced a proposal to establish a transcontinental system of loading air cars for the airlines. A different group, with as yet very much in the embryo stage, is also eager to share the air transport industry how to develop the latest stream power which is present in air freight.

Totaleronometric experts to all sources, the first half of the year of 1940, totals \$136,000,000, representing a 122 percent increase for the 90 period in 1939 and 17 percent increase for all of last year.

Pitcairn Whirl Wing

(Continued from page 47)

the kinetic energy which had been stored in the overpowered rotor is then converted into lift. This is the principle on which the prop take-off works.

The general arrangement of the power and control units within the Whirl Wing is shown in the photograph. The engine is a Whirlwind 240-hp, a supercharged aircraft engine. The tail is fitted with an isolated metal finned heat. The nose of the ship carries the transmission and power unit delivered from the engine in this transmission unit at a bearing between the two units. The tail unit with the propeller is supported by a central column. At the front of the transmission, the main control surfaces, which consist of the upper and lower rudder, extend from the upper rear of the unit.

The operating controls in the Whirl Wing are said to have been designed and arranged to provide the utmost simplicity and ease of operation for the pilot. The main control is a Cyclic stick type of direct control of which the control is employed to provide longitudinal control and lateral control. For longitudinal control, the conventional controllable pitch wheel is moved forward or backward on its sliding column. For lateral control, the wheel is turned to right and left. Foot pedals are connected to a rudder control which also connects the directional flight control.

In previous direct-control autogiros of larger size, certain difficulties were experienced at times because of the tendency of rough air and other rotor disturbances to be transmitted down to the cockpit. The smaller ship, however, the author believes, has been designed to eliminate these difficulties. As in previous autogiros each rotor blade is attached to the hub through two longons; namely, a flapping longon which permits a limited up and down movement of the blade, and a drag longon which allows for angular movement of the blade.

The features present in the Whirl Wing have also attracted other groups outside all the aviation industry. It is suggested that a railroad air freight expansion has advanced a proposal to establish a transcontinental system of loading air cars for the airlines. A different group, with as yet very much in the embryo stage, is also eager to share the air transport industry how to develop the latest stream power which is present in air freight.

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Indirect view of the Culver Codet, now flying 800,000 feet.

Standard equipment includes an stabilized cabin, a baggage compartment after the seats and large enough to accommodate 80 lb. (maximum) of baggage and the following armament: one speed selector, shaver, compass, tachometer, oil pressure and oil temperature gages.

SPECIFICATIONS

| | |
|--------------------|------------------|
| Span wise | 30 ft. 6 in. |
| Gross weight | 11,750 lb. |
| Empty weight | 6,250 lb. |
| Power | 250 h.p. |
| Speed | 145 mph. |
| Cruise | 114 mph. |
| Altitude | 14,000 ft. |
| Range | 1,200 miles. |
| Rate of climb | 1,200 ft./min. |
| Service ceiling | 16,000 ft. |
| Wing area | 300 sq. ft. |
| Wing load | 38.8 lb./sq. ft. |
| Wing aspect ratio | 4.0. |
| Wing camber | 0.005 in. |
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Research for Defense

(Continued from page 59)

one of degree of intensity rather than one of shift or duration. This is as true for research as it is for industry generally. It is also plain that all such efforts have been clearly directed toward the development of materials and machines for the fighting forces, rather than the creation of higher standards of living for all.

Whether we like it or not, our research must start its point of view to meet this situation. Where we have been accustomed to thinking in terms of bettering our products for general improvement in our standards of living we must now begin to think our efforts toward the production of war materials. We realize that, for example, other countries have more resources than ours. Our laboratories must begin to concentrate on armor-piercing glass for bomb casings and for range-finder slates, rather than on better glass for better homes and safer glass for safer automobiles. For the time being our chemists may have to give up their work on lighter metals, lighter fibers, and more insulating fabrics for the world of fashion, and put most of their effort on more efficient fuels for fighting aircraft, or more efficient metal plates. Our aeronautics and naval engineers designers must put on the shelves their designs for safer, safer, and more comfortable flying. They must give up their continuous research and most head every effort toward producing neither and more deadly fighters, larger and more efficient bombers.

Now that the time has been clearly defined, what are we doing about it?

To us, in addition, although we have some of the best scientific brains in our country, the fact that we have the time to use is no guarantee to make use of our whole physical and moral resources without stint. Recognizing the vast research potential of the country, unified and concentrated for purposes of national defense, President Roosevelt, on June 15, 1940, created the National Defense Research Commission. This commission acts directly under the counsel of National Defense—a group including the Secretaries of War, Navy, Interior, Agriculture, Commerce, and Labor. The functions of the Research Commission—quoted from the Presidential order of June 15, 1940, are: "To conduct and support scientific research on the mechanisms and devices of warfare, except those relating to problems of flight included in the field of activities of the National Advisory Committee for Aeronautics. It shall aid and supplement the experimental and research activities

at the War and Navy Departments and any conflict research for the extension and improvement of armament, weapons and materials of warfare."

Here, then, is research as flexible and mobile as ever—in the industry for science to begin the immediate task of beating its plowshares into a sword.

In the excitement of the moment there is, however, one factor that we cannot easily control: the rate at which planes can be delivered to the front of Valence. We are not yet involved at total war. Our present purpose is only to build up our defenses to keep war away from our shores. For the meantime, therefore, only a part of our research capacity should probably be devoted to military purposes. Some of it, though, has to do with aircraft. The aircraft industry, we are told, already operates with some has already applied it. It is important, however, to remember that our capacity for research projects is not only what we need for the present limited emergency, without losing sight of long-range fundamental problems due to the war. We must also take account of the war in its entirety. It is definitely a part of the new Research Commission's responsibilities to coordinate and to plan our research effort properly so that research that is essential to our existence and well-being is not completely disrupted or set aside during this extremely mobile state.

(To Be Continued)

Junkers Jumo

(Continued from page 55)

Motors in Great Britain. The German class of engines provide better visibility for single-engined planes and are easier to build and service in the field. In single-seat and twin-seater fighter aircraft, the propulsive power of the current war-type of high-performance aircraft engine follows increasing order, to the sum production of test quantities of high-performance liquid-cooled engines of a type which has been disclosed at Germany.

Spiralizations

Junkers Ju 88 III aircraft engine. Two, twelve cylinders, water-cooled, air inverted, two-speed direct, four cycle. Bore and stroke, 5.860 by 5.900 mm. Total weight, 1,200 kg. Length and weight, 900 by 4,600 kg. Rated output, 1,200 at 6,000 R.P.M. 1,000 at 10,000 R.P.M. Maximum take-off, 1,300 kg. Total weight, 1,300 kg. Total weight (dry), 1,200 kg. Fuel consumption, 6.4 kg per hr. Oil consumption, 0.005 kg/hr. Air compression ratio, 8.5:1.

German Warplanes

(Continued from page 49)

to be beaten in the following month by a Messerschmitt Me 109 with a speed of 468.9 mph, which is the present high speed record. The latest Messerschmitt product is the re-engineered Me 110 two-seater fighter, which has a speed of 450 mph in level flight and is said to be superior to the current and efficient Spitfire in maneuvering.

A visit to the Dornier factories at Friedrichshafen on the shores of Lake Constance proved particularly interesting as both flying boats and land planes were being turned out in appreciable quantities. The flying boats alone had a production of 1,000 and a wing span of 2,050 inches. Under the leadership of Countess von FIYR, a four-engined patrol plane built for the United States Navy, basic German planes are equipped with removable tail gun turrets and do not have any blind spot areas. Their safety factor in the event of failure of one engine is 64.25% and they are built with a maximum weight of 10,000 kg. and a maximum speed of 325 mph.

Landing-plane production at the Dornier factories was found to be confined to Do 27 and Do 175 two-seater bombers having a speed in excess of 300 mph and a ceiling of 30,000 ft. Some of them were powered with B.M.W. 132 engines and some with Mercedes-Benz DB 601 engines.

Practically all the observations planned by the German Air Force are held by Bunting which evidently is the largest bearing firm in Europe. In appearance the Heinkel He 111 is similar to the high-wing Douglas observation plane used in the United States. The German plane is powered with B.M.W. 132 air-cooled radials and have a maximum speed of 225 mph.

Junkers has the unique distinction of building gasoline and diesel engines as well as turbines in a dozen or more large factories. The engine produced at Berlin is the Ju 88 dive-bomber (Bf 109), the Ju 88 two-engined high-speed bomber, the Ju 88 four-engined heavy bomber and the Ju 52 three-engined transport plane. In addition, numerous Ju 86-K twelve-cylinder long-range bombers powered with Wright have been produced for the Air Force. The war experience gained from the Junkers factories in war-time operations and their engines are produced by the largest aircraft firm in the world.

Part II of this article describing the Junkers aircraft factories will appear in an early issue of Aviation.



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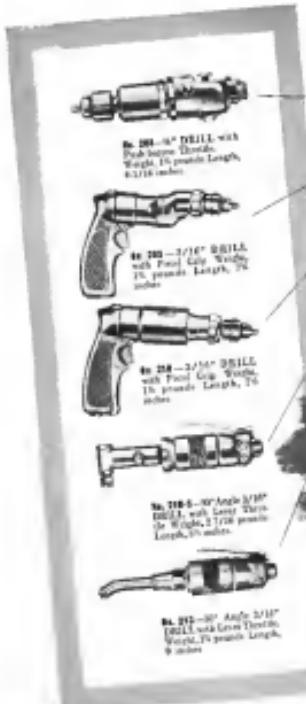
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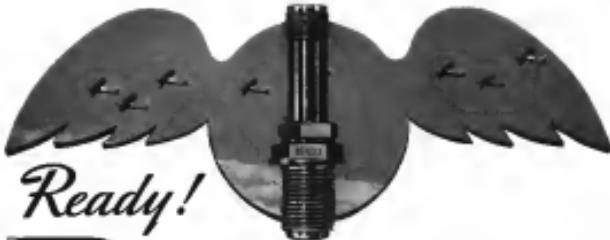
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卷之三

第14章 网络爬虫

（三）植物的根系

| | |
|---|----------|
| REVENUE - DIFFERENT FEE | 81 |
| REVENUE - Different Method and Reward | 82 |
| IN SALE Old Friend | 82 83 84 |
| IN ESTIMATES, SERVICES | 85 |
| IN USE OF PERSONS - Experts and others put less | 86 |



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